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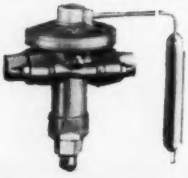

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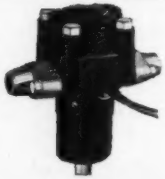

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The Refrigeration Service Engineer

Vol. 6 No. 5

May, 1938

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

Two views of one of the largest and best equipped service shops in the independent service field. Specializing primarily in the rebuilding of hermetic units, such as G.E., Westinghouse, U. S. Hermetic, Majestic, and others, Rex Refrigeration Service, Inc., 2226 S. State St., Chicago, have built up a trade during the long period of their existence, which extends over most of the Middle West

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The Refrigeration Service Engineer

VOL. 6, No. 5 CHICAGO, MAY, 1938 $2.00 Per Annum

Service Data on

The Coldspot Refrigerator

THE Sunbeam Electric Manufacturing Co., makers of the unit employed in the Coldspot refrigerator, originally were manufacturers of headlights, spotlights, etc. Upon entering the field of refrigeration, and up to and including the year 1935, they manufactured refrigerators in comparatively small quantities, selling to several concerns including Sears, Roebuck & Co., Bohn Refrigerator Co. and Major Appliance Corp., a subsidiary of the Sunbeam Electric Manufacturing Co., Evansville, Ind.

Sears, Roebuck & Co., who up to this time had used the unit exclusively since 1930, entered into a contract with Sunbeam Electric for the entire factory output. During the years following, to the present date, the factory has been enlarged and the output increased to a year 'round production of approximately 1,600 units and 1,400 cabinets per day.

From the first unit used to the present day Coldspot, the basic type of system and design of compressor are essentially the same. Structural and layout improvements, or changes, have been made that have contributed to the longer life and dependability of the unit, but have not changed its basic design. The first Coldspot Models A, B and C, manufactured in 1930, were very nearly identical to that shown in Fig. 1. They differed in that they were equipped with a solid cast-iron base on which the motor and compressor were mounted, a type J Penn temperature control, a wrap-around type of evaporator with two holdover tanks filled with oil, a conventional shell type receiver mounted at the side of the compressor, and an American Radiator expansion valve. This unit did not employ the spring type mounting found on all later models.

Models D, E, F and G, manufactured during 1931-1932, were as shown in Fig. 1. In this model, you will note that the receiver is made of pipe formed in a horseshoe shape, which also served as a base for the motor and compressor. Detroit Lubricator expansion valves were used on this and all succeeding models.

In the DA, EA, FA and GA models, manufactured in 1933, the motor and compressor were bolted solidly together as shown in Fig. 2, thus eliminating considerable alignment and coupling trouble. The compressor housing, or cover, was reduced in size and changed from a comparatively heavy casting to a pressed steel cover. The oil-cooling coil, which formerly was interwound with the condenser coil, was formed into a small circular coil, and installed at one side of the compressor.

Models J, K, L and M, manufactured in 1934, appeared almost identical to the 1933 models, the only apparent changes being in

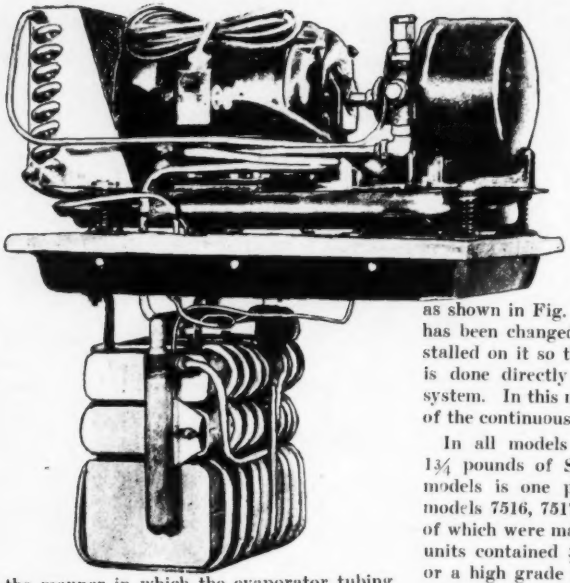


FIG 1.—MODELS D, E, F, G, MANUFACTURED IN 1931 AND 1932

the manner in which the evaporator tubing was wound, and the location of the thermostat and expansion valve.

From 1934 to 1937, little change in the layout of the unit was made. In 1937, the charging connection and check valve, as shown in Fig. 3, were rearranged so that the charging valve is on the side, while the plug through which the check valve ball can be removed, is on the top. In the 1938 model, as shown in Fig. 4, the shape of the receiver has been changed, and a charging valve installed on it so that charging of refrigerant is done directly into the high side of the system. In this model, the evaporator is still of the continuous tube direct-expansion type.

In all models the refrigerant charge is 1¾ pounds of SO_2. The oil charge in all models is one pint with the exception of models 7516, 7517, 7518, 7519, 7520, 7521, all of which were manufactured in 1936. These units contained ¾ of a pint of oil. Argon or a high grade of white mineral oil is recommended for use in these units.

Service Instructions

Spring Mountings. On the older type models, units were equipped with lag screw-type spring mountings. In order to check motor alignment properly and to reduce vibration noise, lag screws must be backed out until the unit floats free on the springs, and

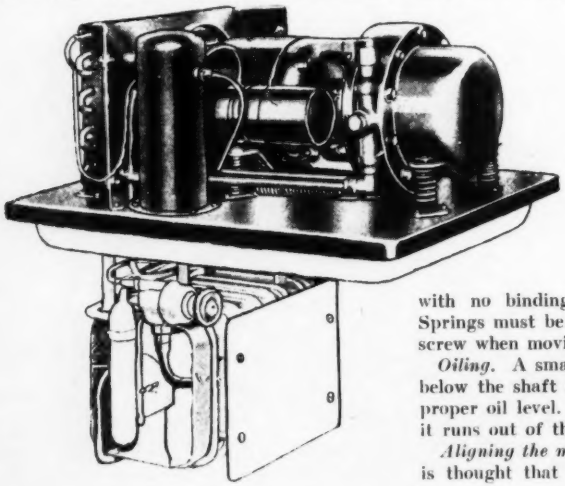


FIG. 2.—MODELS J, K, L, M, MANUFACTURED IN 1934

with no binding at the rubber cushions. Springs must be tightened down with a lag screw when moving or shipping the unit.

Oiling. A small hole in the motor casting below the shaft acts as an indicator of the proper oil level. Oil should be added until it runs out of this hole.

Aligning the motor. If, for any reason, it is thought that the motor is out of align-

ment due to noise or wear at the coupling, it may be realigned as follows:

Loosen the set screw in the motor drive coupling on the motor shaft. Spread the two couplings apart to a distance of about ⅛ inch. Tighten set screw and run the unit. By pressing upwards, downwards, and back and forth on the coupling end of the motor while the motor is running, it will be found that the coupling noise will increase or decrease. If an increase of noise accompanies the movement in all directions, the motor is in correct alignment. If the movement in

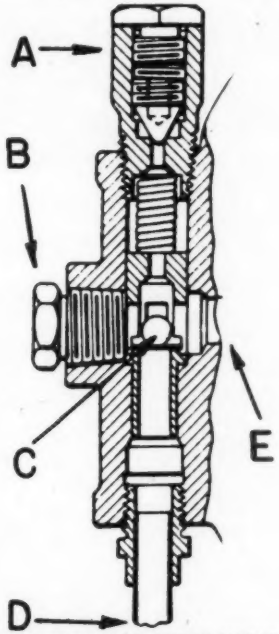


FIG 3.—THE COLDSPOT CHECK VALVE AND CHARGING CONNECTION

A. Charging Connection
B. Discharge Plug
C. Check Valve
D. Suction Line Connection
E. Opening to Compressor

one direction is found to decrease the noise, the motor should be realigned as follows:

Determine which way the motor should be moved, whether up, down or sidewise, or a combination of two directions. The method of raising or lowering depends on the type and make of motor. Century motors have a flexible base, which could be bent to correct the alignment. To raise the motor, insert a small bar between the body of the motor and the support, and pry the motor body upwards (see Fig. 5). Do this on as many corners as is necessary to level the motor. To lower the motor, the flexible supports can be bent downward by sharp striking with a hammer. The raising and lowering of the motor in this manner is accompanied by a sidewise movement. Due to this fact, the vertical adjustment should be made first. At times, with the drive couplings separated, the motor can be raised by pulling up on the shaft with one hand, while pushing down on the compressor with the other. It may be lowered by putting both hands on the motor, and giving a sharp push downward.

Aligning the General Electric motor is done in a similar manner as the above, except that the bending is done at different points (see Fig. 6). In aligning this motor, put the pressure on the bent-up portion of the base plate so as not to loosen the base screws.

The Sunlight Clutch motor employs a system of adjusting screws and wedges. The method of adjustment on this motor is immediately apparent upon examination of it, and does not require any further explanation here.

The motor is properly aligned when, with the pins and holes of the couplings engaged metal-to-metal, it runs perfectly quiet. When alignment is secured, slide the motor drive coupling back and insert the drive washer, allowing ⅛-inch clearance between the washer and one coupling (see Fig. 7). Be sure to pull the set screw down tight on the flat place on the motor shaft.

Worn pins in the drive couplings, and worn drive washers on units that have been in service for some time, are caused by misalignment. Noise and vibration result from worn pins, and both couplings and drive washers should be replaced. This service operation can usually be done without disturbing flexibly-mounted motors. Removing the drive washer and compressor coupling first, the motor drive coupling may be removed by springing the motor away from the compressor. Occasionally, the motor base bolts must be loosened, and the motor moved to one side.

Checking Adjustments

In checking the expansion valve and thermostat adjustments on the Models A, B, C, D, E, F, G, DA, EA, FA and GA, the thermometer well, clamped to the tube next to the one leading out of the expansion valve (the second to frost up) should be

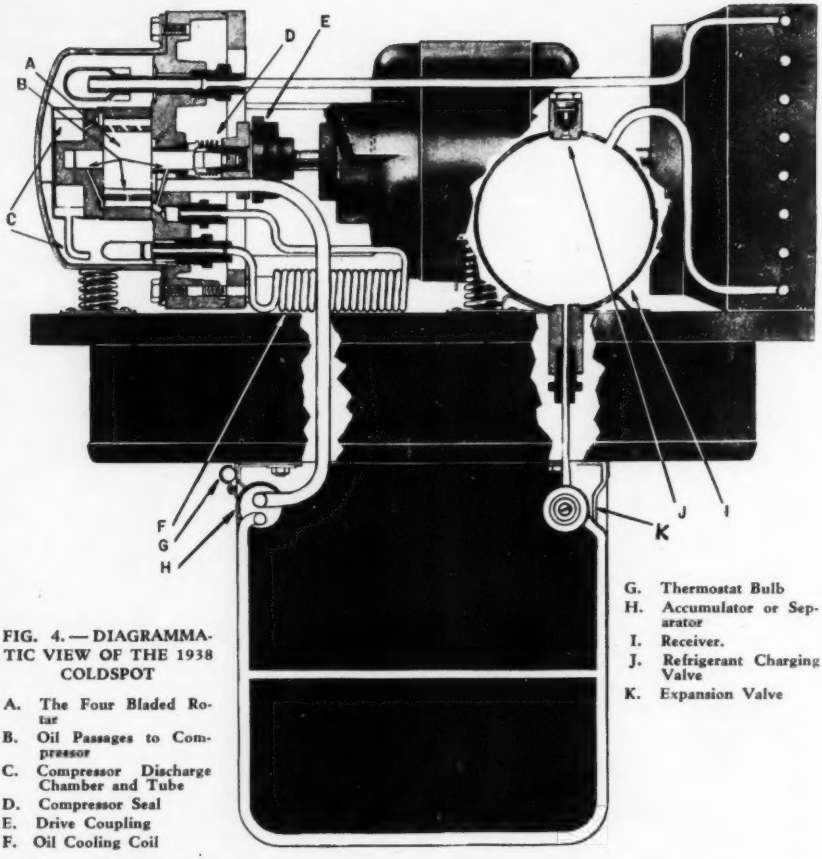


FIG. 4. — DIAGRAMMATIC VIEW OF THE 1938 COLDSPOT

A. The Four Bladed Rotar
B. Oil Passages to Compressor
C. Compressor Discharge Chamber and Tube
D. Compressor Seal
E. Drive Coupling
F. Oil Cooling Coil
G. Thermostat Bulb
H. Accumulator or Separator
I. Receiver.
J. Refrigerant Charging Valve
K. Expansion Valve

used. Remove the frost where the well is to be clamped, so as to get a good metal-to-metal contact, insert the thermometer and fill the well with oil. The thermostat should be shorted by inserting a piece of wire across the connections. Ice trays should be removed. Food compartment doors should be closed and opened only when taking a reading. After the machine has run approximately eight minutes, read the thermometer without removing it from the well. Continue to read at intervals of two to three minutes until the temperature has become constant, and has dropped below eight degrees. When the valve is correctly adjusted, the temperature will remain constant from eight to eleven degrees. While an adjustment within this range is desirable, it may be necessary to vary one or two degrees from these limits in order to adapt a particular unit with cabinet. If the temperature is more than two degrees off, adjust the valve to bring it within the limits. Always allow plenty of time after an adjustment for the temperature to become constant. The cutting-in temperature, when checking the thermostat adjustment with the thermometer well, will be about 28 degrees. The procedure followed with all thermostats should be the same. Check expansion valve setting first, then the cutting-in point of the thermostat, then the cutting-out point. In the Penn thermostat, the cutting-out point can be adjusted without affecting the cutting-in point.

Refrigerant Condensed in Compressor. A long idle period, such as a week or more, will sometimes cause an excess of refriger-

ant to condense in the compressor, and displace the oil temporarily. The unit will run continuously, will not refrigerate, and the compressor will be very noisy. Correction of this condition may be obtained by raising the compressor end of the unit until the noise begins to diminish, running it in this position about ten minutes, then returning the unit to its proper level. If it does not then run quietly, run it in a tilted position for another ten minutes.

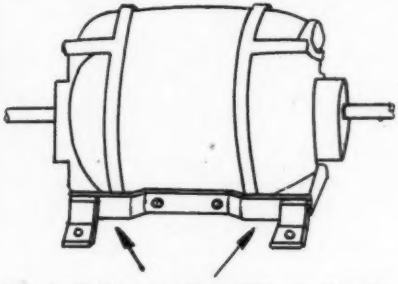


FIG. 5.—BEND UP OR DOWN AT POINTS INDICATED

Removing Defective Motors. If, for any reason, the motor must be removed for repairs, or replacement, on the later type units which have motor and compressor bolted together, it may be done by pulling the motor cord and lamp switch cord, removing the female plug from the thermostat cord, and pull the cord through the lid. Remove the lamp and receptacle locking ring below the lid, and receptacle cover plate above the lid. Remove the two spring mounting nuts, four fan housing screws, and four motor cap screws. Move the motor to one side and lift out the receptacle. Some motors have the capacitor mounted on the frame of the motor, in which case, the motor and capacitor may be removed together. Those having the capacitor mounted separately on the lid, by disconnecting the wires in the capacitor terminal box, the motor may be removed without the capacitor. The motor may now be removed, with the fan housing hanging on the fan and being removed with the motor. When reinstalling the motor, be sure to provide a $\frac{1}{8}$-inch clearance for the drive washer, as shown in Fig. 7. To replace the drive couplings and drive washer, remove the four motor cap screws, and push the motor and compressor apart. Holding the seal with the spanner wrench, or pin, in the hole provided, unscrew the compressor drive coupling, remove the motor drive coupling, and install the new couplings in the same manner.

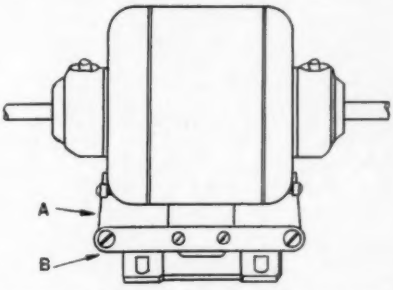


FIG. 6.—STRIKE DOWN AT A. PRY UP AT B

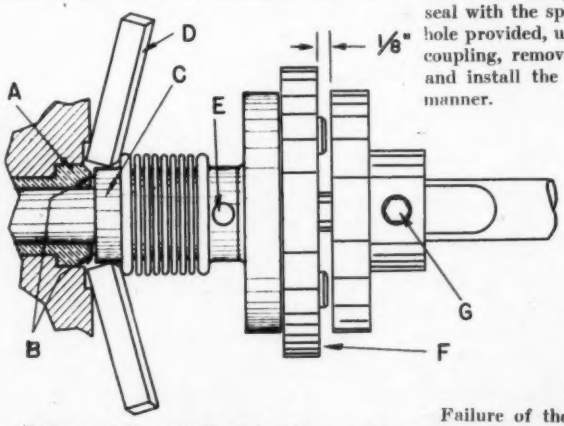


FIG. 7.—SEAL AND DRIVE COUPLING ASSEMBLY

A. Compressor Bearing and Seal Seat
B. Running Surface of Seal
C. Steel Seal Nose
D. Wood Pry
E. Hole for Spanner Wrench
F. Drive Coupling Washer
G. Set Screw

Capacitors

Failure of the capacitor will result in a slow starting or dead motor. Connecting another capacitor of the same type, known to be good, in place of the suspected one, is a simple test for capacitor failure. Each capacitor is numbered, and this number must

be the same as the capacitor number on the name plate of the motor with which the capacitor is used. If the capacitor is mounted on the frame of the motor, the wires must be disconnected at the terminal box on the front of the motor. If the capacitor is mounted independent of the motor, the terminals are in the capacitor box and the wires may be disconnected there. Be sure to connect all wires as found originally.

Thermostats

When testing for a dead or defective thermostat, first be sure there is power to the thermostat. Inspect for loose connections, then short-out the thermostat by inserting a U-shaped piece of wire into the female plug. If this starts the motor, the thermostat is no doubt defective and must be replaced. If the motor, however, still does not start, the trouble is probably in the motor or capacitor. If a new thermostat is not immediately available, the unit may be temporarily operated with the U-shaped shorting device remaining in place, and instructing the customer to operate the refrigerator manually by pulling the motor cord. Fifty per cent running and idle periods of two or three hours each, will be satisfactory. The thermostat may be adjusted by resetting the cold control knob. Since the one adjustment controls both the cutting-in and cutting-out points, it is only necessary to use one point. The method available for checking adjustment in the field makes it necessary to use the cutting-in point. To raise the cutting-in point, turn the cold control knob to the warmer position, which gives the desired cutting-in temperature. Remove the small disc in the center of the knob, and the screw which the disc covers, and take the knob off the shaft. Being careful not to disturb the position of the shaft, replace the knob with the arrow pointing to 5, then replace the screw and disc.

To Be Continued

In the June issue service data on the later models of Coldspot unit together with additional data on all models will be given.

Porcelain Finishes

Its Origin, Development, Care and Repair

By L. K. WRIGHT, M.E.

PORCELAIN enamel on steel is an excellent preservative for the metal structure, is thoroughly sanitary and to the eye the most pleasing of all refrigerator finishes. It is more expensive than the painted or sprayed finishes, but it has lasting qualities not possessed by any other coating. Witness the signs and even structures of porcelain-on-steel which are common enough on every street and road.

Interiors and exteriors of all porcelain refrigerators on the display floor should always be immaculate. Special soft dust cloths, such as light flannel, should be used and after each dusting these cloths should be washed to remove the abrasive particles they have picked up, otherwise continued use may result in marring the refrigerator finishes, whether they be of genuine porcelain enamel or cellulose finish.

First Care of Cabinets

Purchasers of porcelain refrigerators should be instructed in their proper care. Interiors and exteriors should be washed with lukewarm water to which two tablespoons of soda has been added to each quart. Soda is more than a cleanser, for it serves as a deodorant and water softener. It is not a poisonous substance and it will actually preserve porcelain finishes. With boxes that have been in use it will eliminate all unpleasant food odors and render the interiors sweet and clean. With new boxes and also with old ones which have remained closed for a considerable period, it is best to leave them remain open for several hours to dry and sweeten.

The cleaning operation should be repeated at intervals of about one month, unless the humidity is excessive or odorous foods have been left in uncovered dishes, under which conditions it will be necessary to clean the refrigerator more often.

Freezing trays and particularly the rubber ones should be scalded before they are used. Periodically such trays should be scalded to

remove any "bloom" which may come to the surface. A clean box and trays assure tasteless, odorless ice and a thoroughly pleased customer. Water should not be allowed to stand in the trays unless it is kept frozen. The drip or drain pan should be emptied as often as possible for most of the food odors are contained in the frost or drip. Clean the pan thoroughly after each defrosting, preferably washing with soap and water.

Care of Porcelain Exteriors

Years of research and the careful checking of records of actual use have indicated porcelain is the one finish for a refrigerator that will resist all climatic conditions. It must, however, be properly and sensibly handled, so that the metal on which it is applied is not bared or exposed.

A great many porcelain boxes have been destroyed or rendered useless by the carelessness of delivery men, installers, service men and even the user. This results through not heeding precautions in regard to striking, flexing, or imposing heavy weights on limited areas of the surface. Installers and service men damage cabinets through ignoring or not following the instructions provided by the factory. Owners abuse cabinets merely because they have not been properly instructed in its care at the time of the installation. This is really a responsibility of the delivery crew or installation men if the distributor does not insist upon the salesman or demonstrator giving this instruction.

Much damage can be obviated by the use of printed forms, pasted on the inside of the service door of the refrigerator where the user will see it and note the printed precautions given. Installers, delivery and service men, should be lectured occasionally on the handling of porcelain refrigerators at service or factory meetings. If the following suggestions are compiled with in handling porcelain cabinets, very little chippage or damage of any great extent will be encountered.

The Handling of Cabinets

To begin with, it must be remembered that the porcelain panels on the exterior of the cabinet are not designed to carry the weight of the cabinet and that these panels are suspended in position with rubber gaskets and cushioned washers. In handling or trucking it must be observed that no metal on the conveyance comes in direct contact with the porcelain, nor that the weight of the cabinet is localized on any small porcelain area. This means that the cabinet should not be laid on its back or trucked in upright position unless in its case or in special rigs. Refrigerator trucks have been designed with straps or stirrups with all hard contacting surfaces covered with heavy padding, so that no rivets, bolt heads or sharp corners can throw any unusual pressure on the porcelain panels.

In moving the crated refrigerators the back of the cabinet should be on the bottom, next to the truck. The cabinets should not be dropped, either from the freight car or the delivery truck. Damage always results if this is done. With the crated cabinet on the hand truck it should be gently pushed upright and set in place on the truck or in the warehouse. If "pitched" by a sudden rush or jerk of the hand truck, the impact may cause damage. If the hand truck is used as a battering ram to bump the cabinets in place, it will result in damage.

Crated refrigerators should be delivered by trucks equipped with skids. If allowed to slide directly off the end of the truck the crate will strike on one edge and the porcelain may be chipped as a result of the drop.

Removing from Crate

A nail-puller, instead of a hammer or a pinch bar, will prevent broken or chipped porcelain, when removing a cabinet from the crate. If the cabinet is shipped with feet in place it may be carried directly into the house. Where the feet are packed away inside the cabinet, they should be unwrapped and fastened in place. To do this, especially if the work is done on a concrete sidewalk, leave the refrigerator on its wooden packing base. Tilt the cabinet back and apply the front legs. Then walk the cabinet forward off the packing base to a piece of thin wood or pieces of the carton in which the legs were packed, to prevent chipping or scratching of the lower part of the legs. The rear legs are placed by tipping it forward. If the enamel is scratched the legs are bound to rust up and become unsightly, for scrubbing water is certain to be retained between the legs and the floor covering and will bring about quick rusting.

If desired, Bakelite, glass or hard rubber pads may be slipped under the feet once the refrigerator has been set into permanent

place. Any dirt or grease spots imprinted on the front of the box by the rubber gasket should be removed with "Carbona" or carbon tetrachloride. Any dirt, finger prints or dust can be removed from the panels with a damp cloth. The user should be instructed to wipe off immediately any milk, fruit juices, etc., that happen to be spilled on the porcelain finish.

Cabinet Finishes

There are several forms of refrigerator finishes. In the early years all refrigerators were of wood, with varnished surfaces. Then the various forms of enamels came into use, first being applied with a brush and later sprayed with air or gas pressure.

Porcelain, in heavy thick slabs, was also used, as well as an opalite or white glass. Research served to develop a porcelain-enamel on metal. Lacquers and the so-called Duco finishes came into use and were widely adopted. Most of the modern boxes are fabricated of metal panels or pressings provided with either a lacquer or enamel finish.

One of the cabinet manufacturers possesses a secret formula for making flexible porcelain enamel. A portion of the ingredients volatilize and leave the enamel in such condition that the sheet metal upon which it is baked can actually be hammered and bent sharply without cracking the coating.

Porcelain

The terms porcelain and porcelain-enamel have been used in a rather loose manner. In spite of the fact that there is a difference between the two substances,—porcelain being a true ceramic and porcelain-enamel being the coating fused on metals—many refer to cabinets as being of porcelain, when, in a strict sense, they wish to imply that the refrigerators are of sheet steel with a fused porcelain-enamel coating. The characteristic ingredients are similar and the development of one process has influenced the progress of the other, but the proper terminology should be used in describing cabinets to prevent confusion. Cabinets are obtainable which are constructed of slabs of porcelain or even of interiors molded and baked in one piece. Such boxes are extremely heavy and expensive. The porcelain-enamel type has almost entirely superseded this solid porcelain variety.

Origin of Porcelain

Porcelain itself is not a new substance for it was known and used by many civilizations before the birth of Christ. Just where and when the first discovery took place is not definitely known. Many historians credit China with the manufacture of the first porcelain pottery some 2,000 years B.C. The first porcelain wares were of a composition not unlike our common clay products. Of course, the Egyptians, Mayas, Aztecs, Persians and other races of antiquity also learned to burn clays and to manufacture porous, friable pottery at an early date, but the finer product, true porcelain, was probably first produced in China.

Until the reign of the Han Dynasty in China; that is, about 185 B.C., most of the pottery produced was of the coarse, porous colored variety, not particularly pleasing in its vari-hued appearance and of but limited utility. Porcelain of the hard glazed, white, translucent type was developed along with other arts during the Han Dynasty.

The early Chinese potters told fanciful tales regarding these products and of their manufacture. One of the popular explanations was that the pottery was composed of marine animals, eggshells and similar substances. Of course each person to whom this "secret" was imparted was pledged to secrecy, lest others profit by the knowledge.

The word porcelain is taken from the French term porcelaine, which, in turn, was derived from the supposed resemblance of the glazed surface of such pottery to that of certain marine shells having a pleasing satin finish known as porcella. Since the early clays were obtained from marshes or old river beds, the crumbled, pulverized substance so strongly resembled the remains of marine shells that the early Chinese may have thought the material to actually be old shell deposits. Again one must remember in translations it is difficult to convey thoughts with great exactness as to meaning.

There have been various theories advanced concerning the first discovery of the baking of clay and coarse porcelain; among them the suggestion that early man, in traversing a bog or swamp, happened to kill an animal and, of course, built a fire to cook the meat and appease his hunger. It was thought that the clay retained the impressions of his feet as he moved about dragging wood for the fire and after the fire had died down the permanently hard indentations furnished the idea of forming and baking hollow vessels from such clay to hold foodstuffs or water.

Another theory is that since ancient man was accustomed to enclose fowls in clay and then place them in the hot embers to roast,

it may have been observed that certain clays became very hard and retained their shape, even when immersed in or used for holding water.

Expansion of the Art

The art of compounding, forming and baking porcelain has passed through a long period of evolution, the development being influenced by the people of many races. Through the years better methods of firing or baking the formed plastic and the value of other minerals, clays or compounds added to the base materials were learned. Certain common metallic compounds, such as iron and copper were found to impart green and red colors to the fused porcelain. Further study provided ingredients for all the colors of the rainbow.

Little by little, as the years passed, more and more knowledge was gained of the art of compounding and fusing porcelain. About the 15th century, Chinese porcelain began to find its way into Europe, where it attracted great attention because of the delicacy of the objects and their almost perfect whiteness and translucency.

Some of this first porcelain found its way into Italy. Alchemists of Florence, working under Francisco de Medici, succeeded in imitating the Chinese products between the years 1575 and 1585 A.D. This Florentine porcelain was the first of the distinctly European wares to be produced. The type produced by the European workers formed a sort of tie between the older Chinese porcelain and the type with which we are familiar today.

Coating of Metals

Early workers appreciated the fact that porcelain resisted attacks of time, elements, acids and foods. Of course, all early ware was purely ceramic. In time, with the discovery of the coloring effect of different compounds, bits of colored porcelain were inlaid or fused on a metal backing. Soon painting and baking in of the colors came into use. With these advances it was realized that if some suitable method of coating the surface of common metals could be learned, that a real advance would be made in the art. Metals so coated would not corrode and, enclosed in an ageless enamel or shell of porcelain, would be given a practically unlimited life. Articles of solid porcelain without a supporting framework were rather fragile, or if the ceramic body itself was increased in thickness to obtain this strength the weight would be excessive. A real need, therefore, existed for products formed of light, sheet metal, coated with a porcelain enamel, especially in kitchen ware.

Further, a porcelain resistant to the attacks of the citric acid of citrous fruits, the lactic acid in milk, the malic acid in plums, the acetic acid in vinegar, the tartaric acid in grapes, was required. The finish had to be smooth and lustrous, and retain these properties under the conditions imposed by use in the kitchen. Of course, acid resisting enamels had already been known and enjoyed wide use for such articles as pans, table tops, kitchen sinks and vats employed in the chemical industry. While large, heavy sheet metal articles, or cast iron vessels could be coated in a satisfactory manner, the same porcelain formula could not be used on light metal refrigerator panels, linings or baffles, as buckling would occur.

In order to comprehend the difficulties which had to be overcome in developing new formulae for refrigerator linings, it is necessary to understand just how ordinary porcelain is made, the various ingredients used and the processes employed in making it.

Composition of Porcelain Enamel

The basic composition of porcelain enamel is essentially a glass. The material itself is known as frit. The prime ingredient is silica, the principal substance employed in producing ordinary glass.

Frit is divided into two kinds or classes, one used for a ground or bonding material and the other for a finishing coat. The ground coat is generally blue or black, while the finish coat is white. Just as solder will not adhere to the surface of some metals without a flux or preliminary coat of metal, neither will white porcelain adhere directly to steel unless some preliminary bond is established. Agents which act to bind or fuse to steel darken the finished enamel and it is for this reason that the first or ground coating is either blue or black. With the ground coat fused to the metal the white coat can be laid over the ground coat and fused to it, for the two are basically of the same materials and bond easily.

Frit for the ground or preliminary coat is composed of the following ingredients: silica, feldspar, sodium nitrate, cryolite, soda ash, fluorspar, borax, nickel oxide, manganese oxide and cobalt oxide.

With the exception of the nickel, manganese and cobalt oxides, the frit for the

white finishing coat contains all the ingredients present in the ground coat, although the percentages of each are varied. The finishing coat contains tin, antimony and zinc oxides in lieu of the other metallic oxides, as these materials are used to impart whiteness to the enamel.

The silica employed must be iron free and approximately 99.9 per cent pure. It is obtained by grinding quartz obtained principally from Pennsylvania and Illinois. Borax is obtained in Death Valley, California, while feldspar is mined chiefly in North Carolina, Maine and Canada. Fluorspar is mined extensively in Illinois and Kentucky; cryolite, another mineral, is found almost exclusively in Greeland. Sodium nitrate is obtained from the nitrate deposits in Chile and Germany. Soda ash is the common name for commercial sodium carbonate, which is a manufactured product.

Cobalt oxide is a compound obtained mainly from mines in Canada. A slight trace of this substance imparts a blue color to glass. Manganese oxide, a gray-black compound imported from Russia and Australia, imparts a violet color to glass. Nickel oxide, secured from Canada, will impart a greenish-brown color to glass.

Metallic tin, secured from the Malay Straits, is converted into tin oxide. Antimony oxide, obtained from China, and zinc oxide, from the western states and New Jersey, impart a whiteness to glass and are extensively used in the finish coats.

Manufacture of Frit

Porcelain frits are carefully compounded from thoroughly tested stocks. A faint trace of foreign material may cause the entire batch to become worthless. When the ingredients of a particular frit formula have been carefully weighed and assembled they are thoroughly mixed and placed in a smelter, wherein a temperature of approximately 2200 degrees Fahrenheit is maintained. Under this degree of temperature the powdered mass is converted to a molten, syrupy fluid.

When this glass has attained the proper temperature it is allowed to trickle slowly into a pool of cold water. As the thin stream of molten glass strikes the water the sudden chilling causes it to solidify instantly and to shatter into millions of small particles. This material, freed of moisture, is the frit delivered to enameling plants.

The frit, prepared to exacting formulae, is first placed in a ball mill. These are large steel cylinders lined with porcelain brick and half filled with porcelain balls about the size of ordinary baseballs. It is usual to add a clay to the frit as it is placed in the ball mills. One of the best clays for the purpose is known as Vallendar clay, which is mined in the bed of an old course of the Rhine River at Vallendar, near Coblenz. The base or ground coats have a certain amount of the mineral oxides previously mentioned added to the batches, while the white coat stocks may have tin oxide added to further whiten the coat.

The mills, charged with frit, are revolved for a period of about eight hours, during which the balls roll over each other and against the brick walls, this action crushing and grinding the frit to a high degree of fineness. The Vallendar clay serves to keep the finely ground particles of frit in suspension. The clay serves a dual purpose; first to keep the fine frit particles in suspension and prevent settling and, later, to bind the frit particles together and hold the porcelain coating in shape on the steel until it can be fused to the base in the baking ovens.

Burning on Enamel

The steel panels, linings and baffle plates, already formed and shaped, of course, are cleaned of all dirt, wax or oil, immersed in acid baths and finally dipped in a vat of the ground coat frit. This coated stock is then run to the fusing furnaces. Large pieces, such as linings, are placed in box type furnaces, while smaller and less bulky pieces, such as side and top panels, are placed on endless chains and carried through continuous type furnaces.

Ground coats are fused on at about 1600 degrees Fahrenheit. The second coat, which is applied by spraying, is burned on at about 1550 degrees. This temperature does not quite approach that used to fuse on the ground coat, but is sufficient to melt and bond the second coat to the first. In some cases this second coat contains a trace of the metallic oxides used in the first coat, so that the two compounds, being nearly alike, fuse together more easily and bond firmly.

The third coat is then sprayed on and the piece placed in a furnace held to about 1500 degrees Fahrenheit. This is somewhat lower than the temperature used on the previous coats and, while sufficient to fuse the new coat, does not cause the previous enamels to melt. Thus, the metal is actually enclosed

in three separate envelopes of porcelain, each coating adhering to the previous surface and tending to seal any pores.

Refrigerator Porcelain-Enamel

All true porcelain-enamels are high in silica. The higher the silica content the greater the resistance to all food and fruit acids.

With heavy cast iron objects, such as bath and wash tubs, sinks and basins, high silica enamels could be used, for the metal structures were heavy enough to withstand the effects of high temperatures without warping. Where light panels and stamped sheets were to be enameled a very difficult problem was encountered, for the porcelain had to be fused on at about 1600 degrees Fahrenheit and be acid resisting as well. This problem, after intensive research, was overcome and one of the older refrigerating machine manufacturers has installed and now operates the largest porcelain enameling plant in the world to handle their business in this light base work.

Repairing Chipped Porcelain

Several compounds are on the market for use in effecting porcelain repairs. One of the first to be introduced was a white lacquer glaze, composed of finely ground porcelain mixed with a hard drying binder, which was applied as follows:

The spot to be patched was first prepared by chipping away the loose porcelain with a blunt tool. The spot was sanded lightly, first with 8/0 wet-dry sandpaper and then with No. 12/0 wet-dry sandpaper. Then it was washed with lacquer thinner. Small spots were filled level with the white lacquer glaze, large ones being treated to two applications. A few hours time was allowed between applications. The glaze was built up above the surface of the surrounding porcelain.

When the glaze had dried it was rough dressed to the level of the porcelain with No. 000 water sandpaper, wet with water or gasoline and then finished with 8/0 sandpaper. The dressing operation required care, otherwise the surrounding porcelain would be scratched. If the porcelain patch matched the color of the refrigerator it was given a polish with furniture wax and a soft cloth.

If not, the level, smooth patch was cleaned of all evidence of grinding material and sprayed with white lacquer tinted very slightly with black lacquer. Untinted white lacquer will show yellow on porcelain and requires tinting with black lacquer. In spraying the patch with lacquer care was necessary to prevent getting too much lacquer on the surrounding porcelain. Spraying requires a few experiments, so that the proper viscosity of the lacquer can be determined and dexterity in handling the spray gun secured. The proper number of coats of lacquer is found by experiment.

The lacquered patch was allowed to dry over night. Then it was rubbed down with a very fine combination cutting and polishing compound, such as Kennite Rubbing Compound, manufactured by the Pittsburgh Plate Glass Company.

New Porcelain Patching Kit

One of the newer porcelain patching kits contains a tube of filler material. This filler stock is fast drying. To use it the spot to be repaired is first cleaned of all loose porcelain. Then the spot is washed with gasoline or any good solvent. Before applying the filler the spot should be allowed to dry thoroughly. If the spot to be repaired is deeper than the finish or white coat, it is best to apply several coats of filler, allowing each coat to dry for at least ten minutes. The hole must be filled and built up with filler above the surface of the porcelain.

The filler applications are made with a narrow, thin blade spatula. The filler, when dry, is then sanded down flush with No. 12/0 wet-dry sandpaper, wet with either gasoline or water.

Allow the sanded filler to dry, then apply the glaze coat with a stiff bristle brush, not more than a quarter of an inch in width. This glaze coat is furnished in three tints, viz.: pure white, medium and dark. The last two are tinted with black and by mixing combinations of two or three of these tints any porcelain can be matched.

If desired, the pure white can be used. Apply a small quantity of this pure white material within a few inches of where it is to be applied. Then place a tiny droplet of black Duco in the center and work the mass, adding more black if required, until the tint secured matches the porcelain perfectly.

Apply this matched glaze to the filled spot, brushing over it just as few times as possible. If the glaze coat is too thick it should be thinned with Duco thinner and thoroughly mixed and matched before applying. If this glaze coat is left unsanded it will retain about the same luster as the porcelain and not collect dirt.

Rather large surfaces can be repaired on the lower edges of side panels, but it is not advisable to repair chips larger than the size of a pea on the front surfaces of a cabinet in the field. If large spots are to be repaired, remove the panel or the entire refrigerator to the shop so that it can be thrown over on its side. By proper sanding and beveling of the edges and the use of a spray gun very excellent repairs can be made.

Cutting Holes Through Porcelain

Many installers find the necessity of piercing solid porcelain, opalite or plate glass panels in order to extend the suction and liquid lines into show cases, refrigerators or windows. Some times an old, but well-constructed refrigerator of the slab porcelain and shut cork is encountered, the owner being desirous of converting it from an iced to a mechanically-cooled box.

Holes should be drilled by hand; the rather common motor-driven drill dispensed with in this case. Use the slowest speed on a hand drill and prevent it from making sudden movements.

Solid porcelain, marble, opalite glass and plate glass slabs are best drilled by use of a drill made of a piece of a three-cornered file broken off and dressed on an emery wheel. A center punch is used on marble to chip out a starting point. If a piece of tough paper is glued to the surface and allowed to dry it will prevent the drill point from wandering away from the spot.

As the drill enters and the hole becomes deeper the tapered shape of the file enlarges the hole and serves to ream it to greater size. When cutting through glass or opalite keep the drill wet with turpentine. Care must be exercised when the tip of the drill is about to emerge on the underside. Too much pressure will split the plate. As soon as the plate has been pierced, or nearly so, drill from the other face if a well finished hole is required.

CODE OF MINIMUM REQUIREMENTS FOR AIR CONDITIONING

FOR the first time in the history of the fast growing air conditioning industry, the buying public will be offered definite protection against the installation of equipment improperly designed to do the job expected of it or represented to perform all of the functions of air conditioning, when in reality only a partial service will result.

A "Code of Minimum Requirements for Comfort Air Conditioning" just adopted by the American Society of Heating and Ventilating Engineers, and developed jointly with the American Society of Refrigerating Engineers, has set up a uniform procedure for establishing the fundamental basis for the design of comfort conditioning installations.

In the making for the past two years, its sponsors aim at establishing minimum design standards by which purchasers can judge the performance of equipment. While voluntary in nature, it is hoped the code will discourage sale of spurious apparatus under the guise that it is air conditioning.

For winter air conditioning, 70 degrees indoor temperature with 35 per cent relative humidity, when outdoor temperature is 30 degrees, is set as a minimum design standard. For summer air conditioning, an indoor design schedule of "effective temperatures" (which is an index of comfort based on a combination of temperature, relative humidity and air motion) is established ranging from 71 degrees "effective temperature" when it is 80 degrees outside to 75.5 degrees "effective temperature" when it is 105 degrees outdoors.

The code specifies the introduction of outside air for ventilating purposes at a rate of not less than 10 cubic feet per hour, per occupant, or not less than 15 cubic feet in premises where smoking is permitted, with removal of 95 per cent of ordinary dust particles to provide requisite air purity.

Air velocities which account for drafts and are a frequent cause of complaint in air conditioning systems, are limited to not more than 50 linear feet per minute, according to the new code. Control of air temperatures within 3 degrees at the five foot level or the "breathing zone" are also specified in the code.

Donald L. McCausland
Illinois

I wish to thank you for the sample copy of THE REFRIGERATION SERVICE ENGINEER. I I think it is fine for us servicemen. Please start my subscription for the magazine with the February issue.

Mark W. Wanty
Michigan

Enclosed is money order for $2.00, for which please extend my subscription for the R.S.E. magazine for one year. I wouldn't be without it for anything.

Operation of the
Automatic Expansion Valve

By GEO. H. CLARK*

IN the refrigerating systems where an engineer is required, a valve making use of a long tapered needle may be used to restrict the flow of refrigerant into the evaporator. The suction pressure in the evaporator is the pressure that will make the compressor capacity just balance the valve capacity. If, with any definite valve opening, the suction pressure rises the difference in pressure across the valve (inlet to outlet pressure) will be reached tending to decrease the flow through the valve. On the other hand as the suction pressure goes up the capacity of the compressor goes up. Obviously then as the suction pressure rises and the flow through the valve decreases while the capacity of the compressor increases a point will be reached where the flow through the valve exactly equals the capacity of the compressor and a constant suction pressure will obtain.

If the suction pressure is too high the engineer adjusts the valve for a smaller opening. This decreases the flow through the valve and the suction pressure is reduced until the compressor capacity is reduced to just equal the reduced flow.

In a refrigerant control valve of this kind there is nothing automatic about it and if the compressor capacity were increased or decreased the result would show up in the change in suction pressure. If the compressor should stop the flow would continue until the pressure was equalized throughout the system.

The refrigerant enters the valve as 100 per cent liquid and leaves as part liquid and part gas. The volume of the refrigerant leaving the valve is considerably greater than the volume entering the valve. In many cases the refrigerant expands in volume over 40 times. Consequently the valve is referred to as the expansion valve.

When automatic refrigeration came into existence it was necessary to provide a refrigerant control valve which would automatically regulate the opening and closing so as to just maintain the desired pressure in the evaporator while the machine is in operation and which will close off when the compressor stops.

Figure 1 shows one type of automatic expansion valve for use in an automatic refrigeration system.

The operation of the valve is as follows: The refrigerant enters through the screen E and passes down through the passageway shown to the valve orifice L. The flow through the valve orifice is restricted by the needle K.

The adjusting screw B increases or decreases the force of the adjusting spring C. This adjustment may be made so as to give a setting, say, of four pounds gage pressure. In this case if the pressure in the evaporator and valve body goes above four pounds per square inch the increase in pressure acts through the openings around the pin M to push on the diaphragm D to move against spring C to allow spring H to close the needle K.

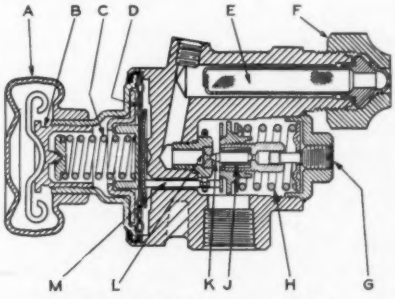


FIG. 1—AUTOMATIC VALVE.

A—Breather Cap
B—Adjusting Screw
C—Adjusting Spring
D—Diaphragm
E—Strainer
F—Strainer Nut
G—Range Adjusting Screw
H—Range Spring
J—Needle Spring
K—Needle
L—Seat
M—Pin

With the valve closed and no refrigerant flow into the coil, the compressor keeps on moving refrigerant from the coil thereby reducing the pressure. When the pressure is reduced to lower than four pounds per square inch the spring C will move the diaphragm against the lower pressure transmitting the motion through the pins M to

*Refrigeration Engineer—Detroit Lubricator Co.

the needle assembly causing the valve to open and allowing the high pressure liquid to push through the valve into the evaporator raising the pressure to close the valve again. Actually then the flow is regulated to the constant evaporator pressure.

The action of the evaporator can be understood by reference to Figure 2. This shows a brine tank evaporator with continuous tube coil. In this case the evaporator contains 40 feet of tube. The tube size is such that the conductivity through it is one B.t.u. per foot per degree temperature difference between the brine in the tank and the evaporating refrigerant in the tube.

For a figure to work with, the condensing unit capacity with a four pound suction pressure will be taken as 200 B.t.u. per hour. In this case then with the brine at a temperature of 80 degrees and maintaining a four pound suction pressure for methyl

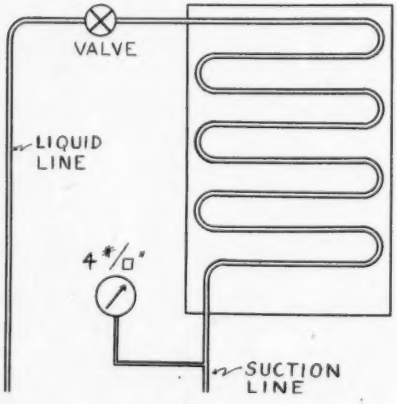


FIG. 2

chloride or 0 degrees evaporation a temperature difference of 80—0 or 80 degrees will exist. Under this condition the length of the coil in actual use can be found to be $\frac{200}{80} = 2\frac{1}{2}$ feet. If the brine were chilled to 70 degrees the length of coil in use would be $\frac{200}{70} = 2\frac{6}{7}$ feet. At 60 degrees the coil length in use is $\frac{200}{60} = 3\frac{1}{3}$ feet; at 50 degrees brine temperature and 0 degrees evaporation $\frac{200}{50} = 4$ feet. Following through in this manner the length of coil in use for various brine temperatures would be as follows:

Brine Temp.	Ref. Temp.	Length of coil in use
80	0	$\frac{200}{80} = 2\frac{1}{2}$ feet
70	0	$\frac{200}{70} = 2\frac{6}{7}$ feet
60	0	$\frac{200}{60} = 3\frac{1}{3}$ feet
50	0	$\frac{200}{50} = 4$ feet
40	0	$\frac{200}{40} = 5$ feet
30	0	$\frac{200}{30} = 6\frac{2}{3}$ feet
20	0	$\frac{200}{20} = 10$ feet
10	0	$\frac{200}{10} = 20$ feet
5	0	$\frac{200}{5} = 40$ feet

It will be noted that with the conditions assumed the whole 40 feet of tube are in use when the brine has been reduced to a temperature of 5 degrees. It is still possible of course to push heat from 5 degrees brine into 0 degrees refrigerant with a consequent lowering of brine temperature. As a result the brine temperature might be reduced to 4 degrees. The amount of coil required to pass 200 B.t.u. per hour to the refrigerant would then be $\frac{200}{4} = 50$ feet. Since there are only 40 feet of coil the refrigerant will only be able to pick up 40 x 4 = 160 B.t.u. per hour in the tank and will have to pick up the additional 40 B.t.u. per hour in the suction line itself. This means that a frost back condition will occur.

If the system is properly controlled a temperature control should stop the motor by the time the brine has come down to 5 degrees and the system is on the verge of a frost back. The control bulb may be clamped to the suction line at the evaporator to the side of the brine tank or may be inserted in the brine itself.

All the while the system was in operation the valve was regulating the refrigerant flow to just maintain the four pound back pressure or suction pressure.

With the machine in operation and the whole coil in use the refrigerant is 5 degrees colder than the brine. When the machine stops, however, and refrigerant is no longer being evaporated and removing heat, the refrigerant in the coil will warm up to 5 degrees and the pressure in the coil will go up from four pounds per square inch gage to six pounds per square inch gage. This increase in pressure will close the automatic expansion valve and prevent the further flow of refrigerant and pressure equalization.

The automatic expansion valve then has two functions. One is to meter the refrigerant into the evaporator at the desired pressure and the other is to prevent the flow of refrigerant during the off period.

If the automatic expansion valves serves those two purposes it is doing its part. If the system still does not refrigerate there may be other things wrong such as too little or too much refrigerant, a faulty compressor or possible plugged refrigerant lines.

Heat Transfer Surfaces for Refrigeration

By JOE ASKIN *

HEAT transfer surfaces made and used in the ammonia refrigeration industry thirty years ago consisted essentially of bare pipe. Serpentine coils were made of this bare pipe, the pipes being spaced about 6 inches apart, and the coils were mounted overhead in the refrigerator. Frost accumulated around these pipes.

These bare pipes were made of extra heavy gage wrought-iron. Ten years later when methyl chloride and sulphur dioxide began to be used for commercial refrigeration, copper tubing was used for fabricating these coils instead of wrought-iron pipe.

About that time another change in construction of surface occurred. Manufacturers began to place fins on these tubes. Just what was the underlying purpose in doing this? The answer is that it was more economical than to use bare tubes. In the discussion following I will try to explain this in as simple a manner as I know how.

Heat is transferred from a warmer to a colder object. Warm air passing by the surface of a tube which is colder than the air loses some of its heat, and hence the temperature of the air decreases. The amount of heat transfer is greater as the surface to which this temperature change occurs is increased. Now a tube has only its *outside* surface exposed to the warm air. Let us attach a fin to this tube having the same thickness as the tube. The fin, being attached tightly to the tube either by being soldered to it or joined by some mechanical means, almost reaches the temperature of the tube. However, *both sides* of the fin are active; that is, exposed to the warm stream of air, and hence heat is conducted from the air to the refrigerant through both sides of the fin.

Bare tube surface is known as "wet" surface, "prime" surface, or "direct radiating" surface.

Fin surface is known as "secondary" surface, "fin" surface, or "indirect radiating" surface.

To what extent can one go in placing fins on tubes? What is the limit? The subject is very complicated. I will not attempt to cover every phase of it but will only mention some of the general principles.

Let us suppose that we have a tube consisting of one square foot of "prime" surface exposed to the air stream. I mentioned above that the surface on the inside of the tube does not count insofar as the transfer of heat from the air to the tube is concerned. Let us now place a fin over this tube having one square foot of surface on each side, or a total of two square feet.

The effectiveness of a fin is its unit capacity in comparison with the unit capacity of the "prime" or "direct" surface to which that fin is attached. If the effectiveness of

* Chief Engineer, Fedders Mfg. Co. Paper delivered at 4th Annual Convention, RSES, Chicago.

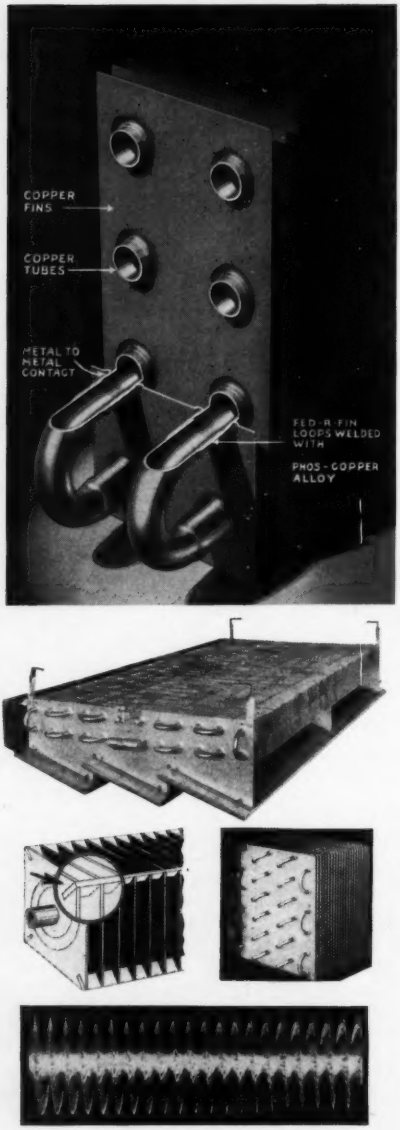


FIG. 1 TYPES OF FIN COILS

the "direct radiating" surface of the fin were to drop to as low as 50 per cent that fin would still be economical to use. Let us assume that the heat transfer of the "prime" surface is 5 B.t.u. per hour per square foot. If the "indirect" surface, or "fin" surface, should be as low as 50 per cent, then .50 x 5 equals 2.5 B.t.u. per hour per square foot would be the transfer of *each* side of the fin. But there are two sides to the fin each having one square foot of surface, and hence the total transfer of the fin is 2.5 x 2 equals 5 B.t.u. per hour, an amount equal to that of the tube. Inasmuch as we made an assumption that the thickness of the fin was to be the same as that of the tube, then the weight of the tube with only one square foot of exposed surface is equal to the weight of the fin with two square feet of exposed surface. We made an assumption that the "fin" surface had an effectiveness of 50 per cent. In actual practice the effectiveness is considerably greater than 50 per cent, and in some cases it is as high as 85 per cent. Of course, it can never quite equal 100 per cent, and if it would, then the fin surface would be as good as the tube surface and there would be no limit as to the amount of surface which could be placed around a tube. The thing to remember is that anything above 50 per cent is "gravy." I also made an assumption that the fin thickness was the same as that of the tube. In actual practice it is only one-half to one-quarter as thick and with only a nominal amount of reduction in capacity. This results in a considerable saving in weight and hence in the cost of the coil.

How Effectiveness Is Changed

Manufacturers have been placing a large amount of "fin" surface on tubes and obtaining economical coils; usually the amount of "indirect" surface is as much as from 90 to 95 per cent of the total surface. With the effectiveness running well above 50 per cent, you can readily see why a finned coil is more economical than a bare tube coil.

The effectiveness of the finned surface decreases as the thickness decreases. A .010 inch fin, for example, may be 25 per cent less efficient than .022 inch thick fin.

The effectiveness of finned surface decreases with its length. A fin which is twice as long has less effectiveness than one which is shorter, or when the tube centers are closer together (if it is a continuous fin).

The effectiveness of fin surface depends upon the conductivity of the material used. Copper, according to Pender's Handbook, has a conductivity of .914. Aluminum has a conductivity of .344. According to Marks' Handbook, in terms of other units, copper

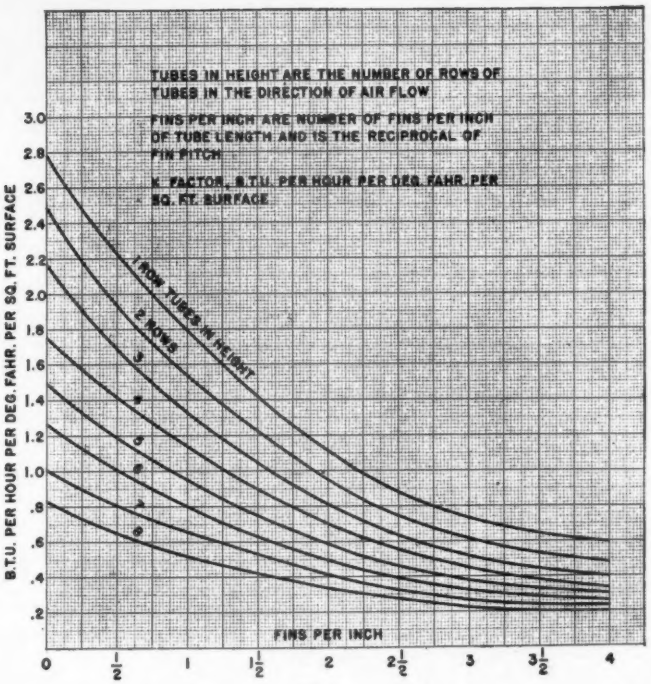


FIG. 2

has a conductivity of 220, and aluminum 119. In other words, copper has from two to three times the conductivity of aluminum. In order to make the effectiveness of an aluminum fin equal to that of copper it would be necessary to use a thicker gage of aluminum, approximately twice the thickness.

The effectiveness of fin surface decreases as the air velocity increases. In Forcedraft Unit Coolers, therefore, the effectiveness of the fin surface would be less than in nonfrost applications where natural convection occurs.

Figure 1 shows different types of finned coils manufactured at the present time by various manufacturers. Each type has certain features which make up good sales talking points. In general they all do the job for which they are designed. The tube spacing varies from 1½ inches to 4 inches. From one fin per inch to five fins per inch is common practice. Or some coil may have zero fins per inch (which is bare tube coil).

You men engaged in the business of refrigeration servicing are not so much concerned about the engineering features of one type as compared to another type as they are to which type will be the most economical to use from any one manufacturer. In the following the problem of how to get the most B.t.u.'s per dollar will be discussed.

In the previous paragraphs I mentioned some of the functions which determined the effectiveness of finned surface. There are several features, however, which affect the "*K*" factor of the coil as a whole and these are:

1. The *K* factor of a coil increases as the fin spacing becomes wider, or the fins per inch become less. This is illustrated in the curve shown in Figure 2.

2. The *K* factor of the coil increases as the coil becomes shallower or thinner in the direction of air flow. Figure 2 illustrates this point as well.

Coil costs, however, are greatest for bare tube coils and least for coils having a very close fin spacing, or coils having a large number of fins per inch.

Figure 3 illustrates a group of coils on

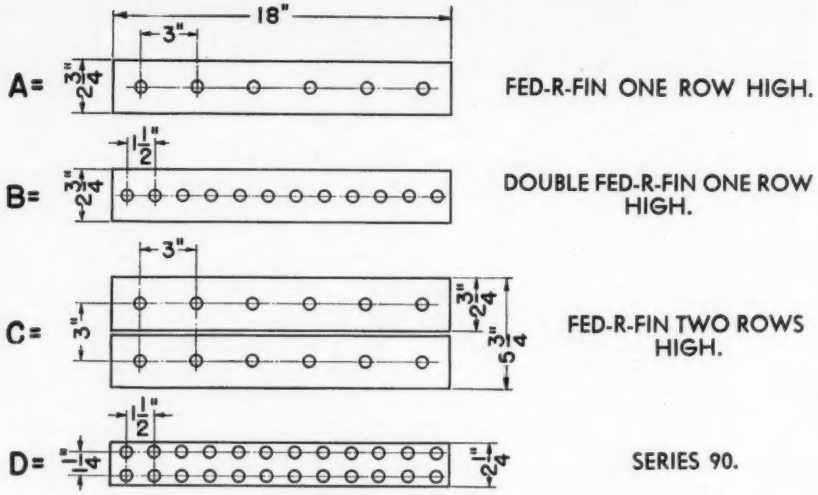


FIG. 3

which study was made to determine which would be the most economical to use or which would give the greatest number of B.t.u.'s per dollar.

Each of the coils tested was 18 inches wide by 80 inches finned length. The fin spacing tested included bare tube coils, coils having 1, 2, 2.66, and 4 fins per inch. The types of coils tested are also enumerated below:

Group A, Fed-R-Fin Coils one row high in direction of air flow.

Group B, Double Fed-R-Fin Coils one row high in direction of air flow.

Group C, Fed-R-Fin Coils two rows high in direction of air flow.

Group D, Series 90 Coils.

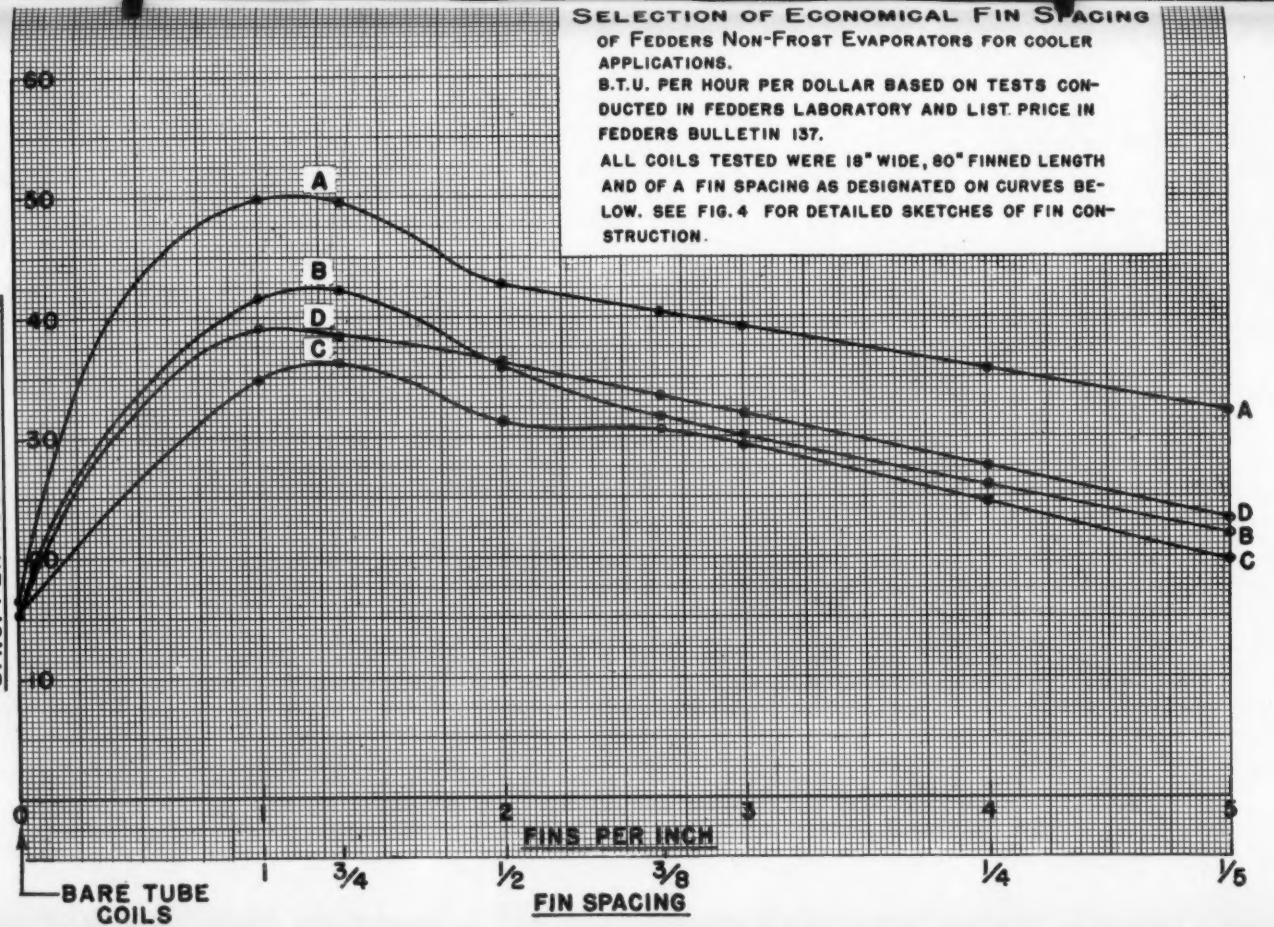
All of these coils were selected from Fedders Bulletin 137 and tested for B.t.u. per hour capacity.

Figure 4 gives the results of this analysis plotted for each of the four groups of coils, and shows at a glance wherein one may obtain the greatest number of B.t.u.'s per hour per dollar. It is interesting to note that a maximum point is reached in these curves, and that deviating to the right or left from the maximum point lowers the economy of the selected coil. It may also be observed that the B.t.u. per hour per dollar for bare tube coils (see zero fins per inch) is about the same as if five fins per inch were used, and that in all the groups tested the maximum capacity is reached at from one to two fins per inch.

The computation of B.t.u.'s per hour is based upon a cooler temperature of 38 degrees F. and a refrigerant temperature of 13 degrees F., or 25 degrees F. temperature difference.

In previous literature it has been shown that the *K* factor becomes greater as the number of rows of tubing in the direction of air flow become fewer. In curves A and C, Figure 4, the comparison is between one and two-row Fed-R-Fin Coils, and indicates that it is possible to get 37 per cent more for a dollar out of a one-row coil than out of a two-row coil at the point of maximum capacity per dollar.

The question may arise as to why the type of coils described as B and D should be considered at all. It will be observed that in these coils a greater amount of "prime" surface exists. The answer is that where available room in which the coil is to be placed is *very limited*, it is necessary to resort to Type B or D, or even to coils having more fins per inch than is most economical in order to obtain the necessary capacity for the job. In other words, it is necessary in showcase applications to crowd a good deal of coil surface in a limited, confined space in order to properly cool that display case. It is not always possible to take advantage of the most efficient and most economical coils on this account, but when it is possible, referring to Figure 4 for information may save one a good deal of money.


SELECTION OF ECONOMICAL FIN SPACING
OF FEDDERS NON-FROST EVAPORATORS FOR COOLER APPLICATIONS.
B.T.U. PER HOUR PER DOLLAR BASED ON TESTS CONDUCTED IN FEDDERS LABORATORY AND LIST PRICE IN FEDDERS BULLETIN 137.
ALL COILS TESTED WERE 18" WIDE, 80" FINNED LENGTH AND OF A FIN SPACING AS DESIGNATED ON CURVES BELOW. SEE FIG. 4 FOR DETAILED SKETCHES OF FIN CONSTRUCTION.
B.T.U. PER HOUR PER DOLLAR
60
50
40
30
20
10
A
B
D
C
0
1
2
3
4
5
FINS PER INCH
BARE TUBE COILS
1
3/4
1/2
3/8
1/4
1/5
FIN SPACING

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

GRUNOW PUMP DOES NOT WORK

QUESTION 254. I have a Grunow unit that is giving me a lot of trouble, and I would like some information on this unit.

It is a Type K unit, and it acts like a stuck pump, but when I got it apart, the pump does not seem to be stuck at all.

I tested out the windings with a test light, and got current through both windings, but the unit will not kick over unless I push the relay down by hand; then the unit will run okay, but if I hold my hand over either the suction or discharge port, the relay drops back to the starting winding.

I have had it all apart, and the vanes and springs are okay. In the lower shell I found oil and liquid Carrene. Should this be, as all the gaskets seem to be all right? The starting condenser seems to be okay, also.

ANSWER: I do not recognize the model of this unit by the K which you have designated. I am not familiar with this marking and, therefore, cannot determine in what year it was built. However, from your description, I am of the opinion that your trouble is most likely due to a lack of oil in the system. I would suggest that the system be drained entirely of oil, and an amount added as follows:

Model year 1933—24 oz.
Model year 1934—30 oz.
Model year 1935-36—36 oz.

These units are designed so that the compressor proper should be entirely submerged in oil. If this is not the trouble, then I believe the only other cause would be a defective starting relay.

ALCOHOL IN SYSTEM

QUESTION 255. Could you inform us if it is advisable to add methyl alcohol to any commercial refrigeration installation using Freon as gas refrigerant, and if so, what is the quantity of methyl alcohol that we should add per pound of Freon circulating in the system?

ANSWER: You have not stated that you have moisture in the system, but since you are considering the use of methyl alcohol, I take it for granted that you are concerned with moisture.

I cannot, under any circumstances, recommend the use of methyl alcohol. All that it can possibly do is to prevent mechanical freeze-ups at the expansion valve, which to my notion, is merely putting a crutch under your trouble. There can be no substitute for a good dehydrator, or dryer, in such cases, which tends to correct the trouble rather than temporarily overcome it.

Methyl alcohol will, in most cases, prevent mechanical freeze-ups. However, in due time, due to moisture and alcohol in the system, corrosion will occur at the expansion valve, and possibly at other points, which will cause considerably more trouble.

WHAT SIZE MACHINE

QUESTION 256. I have a prospect to whom I may be able to sell a commercial condensing unit and coil for a walk-in cooler that is 6x8x10 feet, having 4-inch corkboard insulation, and the unit would operate 16 hours per day. The room temperature will average about 95°F., as the cooler is only operated in the summertime, and the box temperature would be 38°F. The cooler would be subjected to heavy usage.

I calculated the heat load of this cooler to be 4800 Btu's per hour, and would require a unit of ½-ton capacity.

The prospect would like a Norge unit, and I had the people there, and they said the box would require a ½-hp. condensing unit.

What I want to know is how to calculate the heat load to use horsepower instead of tonnage, as to the condensing unit. Is a ½-hp. condensing unit the equal of a ½-ton condensing unit in capacity? How many Btu's are equivalent to a horsepower, and does use of different refrigerants have any effect on the number of Btu's in a horse-

power? If I use a flooded type coil, should I use Freon or methyl chloride? If not, why?

ANSWER: While you did not give me much information about the construction of this box, I am going to take that which you have given me, and set up the problem as best I can. The information we have is as follows:

Box 6x8x10.

Design temperatures 38° inside, 95° outside—57° difference. 4 in. cork heavy-duty service.

Surface—

Top and bottom	2x6x 8	= 96
Sides	2x8x10	= 166
End	2x6x10	= 120
Total		376 sq. ft.

Referring to tables, we find a wall construction consisting of ¾-inch wood on the outside, one layer of paper, 4 inches of cork, and again one layer of paper, and ¾-inch wood on the inside. The resistance of these materials in the order they are listed above is as follows:

K_1 factor, or the surface resistance for wood	.73
Resistivity of ¾-inch wood	.75
Resistivity of one sheet of paper	.08
Resistivity of 4-inch corkboard	12.16
Resistivity of one sheet of paper	.08
Resistivity of ¾-inch wood	.75
K_2 or surface resistance inside	.73
Total resistance	16.28

Conductivity, the figure with which we will have to work, is the reciprocal of the resistance; therefore, we have a conductivity of $\frac{1}{16.28} = .0614$.

From the foregoing, we can now determine the heat leakage of the entire box, which will be 376 cu. ft. × 57° temperature difference × .061 conductivity = 1306 Btu.'s per hour. In addition to the actual heat leakage of the box, we have to take into consideration, the heat entering due to foods, and to air changes caused by the opening and closing of doors, and for this purpose, we will add 25 percent to our total heat leakage, bringing the amount to

$$1307 + \frac{(25 \times 1307)}{100} = 1633 \text{ Btu.'s per hour}$$

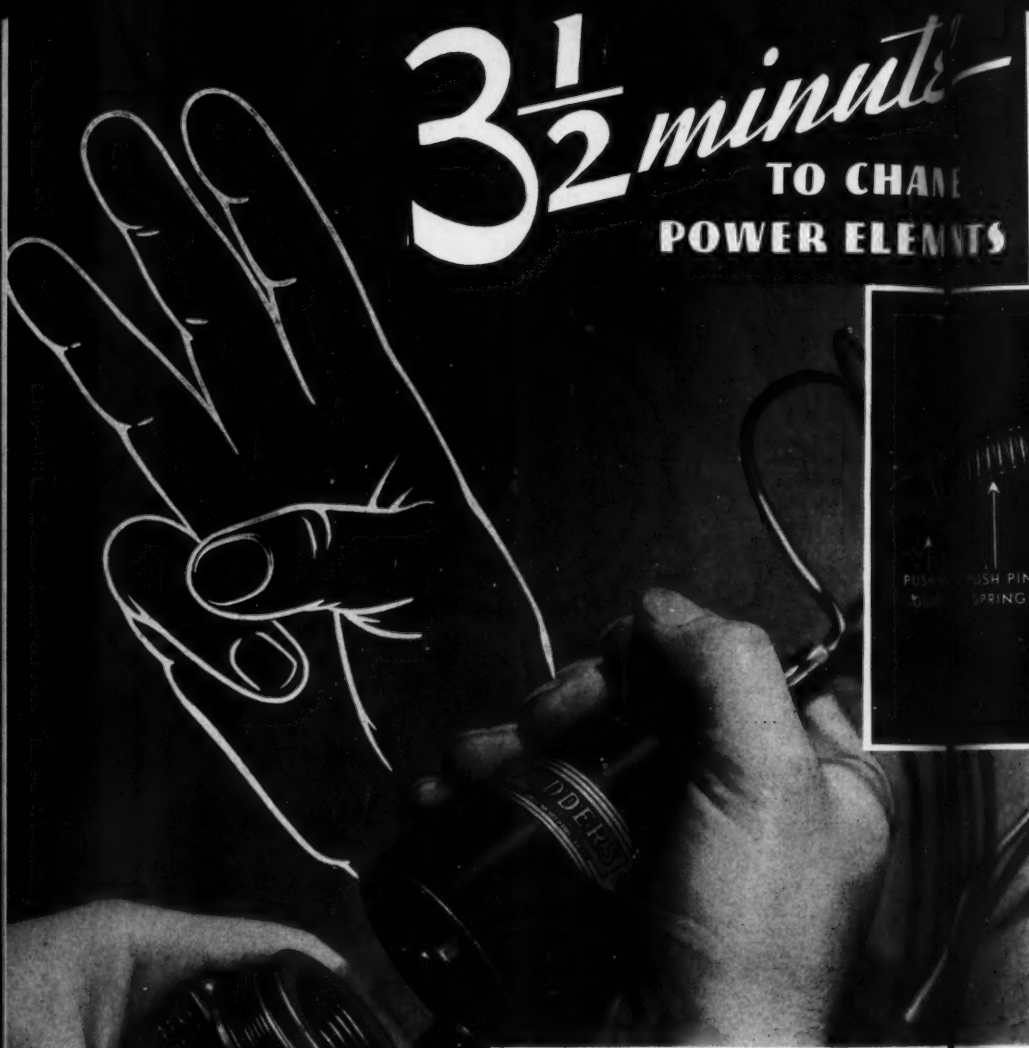
over a period of 24 hours. We will not want our machine to operate more than 16 hours per day; therefore, the machine capacity will have to be $\frac{24 \times 1633}{16}$ which equals 2449 Btu.'s per hour capacity of the machine, or converting to ice melting equivalent (i.m.e.) it will become $\frac{2449}{144} =$ 17 i.m.e. per hour. Referring to one manufacturer's catalog, we find they have a ½-hp. air-cooled machine designed for methyl chloride, which will produce 17 i.m.e. per hour, with a suction pressure of 6 lbs. Since this will allow us sufficient leeway or safety factor, we will consider that this machine is sufficiently large to handle the job. As a usual thing, 1-hp. is considered as equal to one ton of refrigeration produced in 24 hours. This is known as the ice melting equivalent of the machine. Since 144 Btu.'s is the amount of heat required to melt one ton of ice, one ton of refrigeration is equal to 2000 lbs. × 144 Btu.'s, which equals 288,000 Btu.'s per 24 hours. A ½-hp. or ½-ton machine would have a capacity of 144,000 Btu.'s per 24 hours, or $\frac{144{,}000}{24} = 6000$ Btu.'s per hour. This figure, however, can only be considered as approximate, since it is based on a rather high suction pressure and low condensing pressure, and does not apply to lower temperature work. I believe it is much safer and much easier to refer to the manufacturer's catalog for ratings on his machines after determining the total i.m.e. of the space to be refrigerated. Suction pressures, condensing pressures, efficiencies, etc., will change the ratings slightly on each individual make.

The kind of gas will make no material difference to the work done in Btu.'s or to the horsepower rating of the machine. Likewise, I see no reason why the kind of gas should make any difference when you are using the flooded type, or dry type, of coil.

CHANGING LOW SIDE FLOAT TO THERMOSTATIC VALVE

QUESTION 257. Would like to ask what would happen on a low side float evaporator if the float mechanism were taken out and an automatic expansion valve (the job being operated by a temperature control) were installed with the suction side of the expansion valve mounted on an adapter that would fit the liquid line port of the float valve, and the suction line left as is.

Would the expansion valve simply refrig-



Showing Fedders Model 33 Valve being reassembled for complete change of Power Element Bellows and Tube Assembly

Representative Suppliers Everywhere Select Fedders

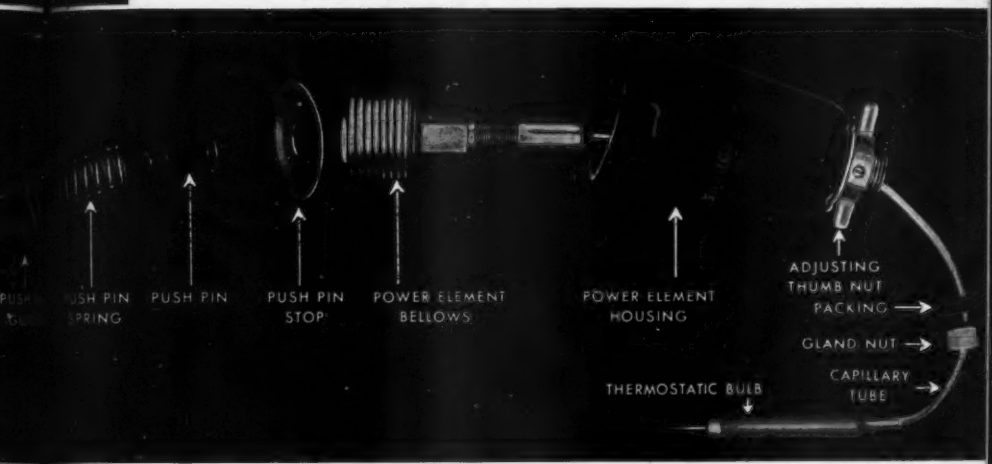
COILS	CONSTANT PRESSURE VALVES
UNIT COOLERS	
EVAPORATORS	CHECK VALVES
THERMOSTATIC EXPANSION VALVES	CONDENSERS
	AIR CONDITIONING UNITS

U. S. Pat. Nos. 1,974,631, 1,987,948, 2,011,379

FEDDERS MANUFACTURING CO. **BUFFALO, N.Y.**

Atlanta - Boston - Chicago - Cincinnati - Dallas

Actual Average Time under Shop and Field Conditions



Another exclusive feature of FEDDERS MODEL 33

Thermostatic Expansion Valves

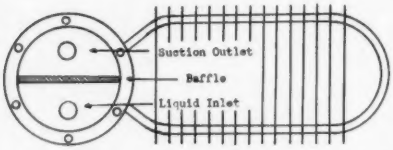
● 3½ minutes is all it takes to change power element bellows and tube assemblies in your shop or out on the job . . . This exclusive Fedders convenience simplifies changing valve over for SO_2, Methyl or Freon . . . saves time . . . reduces inventory . . . speeds up deliveries from limited stocks . . . cuts time on service work. Valve body remains sealed during changeover Proven by years of service in thousands of installations throughout the world.
● You get EXTRA VALUE when you buy FEDDERS Valves, Coils, Evaporators, Unit Coolers, Condensers, Air Conditioning Units and other equipment in the complete Fedders line.

ARE YOU GETTING YOUR COPY

OF THE FEDDERS NEWS?

erate the float chamber and carry right back out of the suction port, or would it refrigerate entire coil? The coil is of approximately the following size and shape, mounted horizontally.

If it did not refrigerate the entire coil, would it work by installing a baffle lengthwise in the float chamber, by soldering thusly:

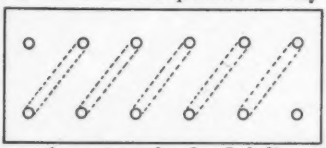


Or would it be better to junk the old coils and install new forced convection coils? There are three walk-in coolers, each with two of the above float coils. New forced convection coils of a capacity to handle the job will cost about $200.00 each installed.

ANSWER: I don't believe that either way of converting this type of coil to a dry expansion coil would work satisfactorily.

While the second method described by you would greatly improve the situation, in either case too many oil traps are created, it would tend to drain the compressor entirely of oil in time. Also, there would be no assurance of all of the surface being refrigerated since a by-pass through one or two of the coils may occur, leaving others to fill up with oil and with no refrigeration.

The only thing I think can be done with this coil is to cut the tubes as close to the header as possible, and solder in return bends as indicated in the accompanying sketch. If it is not possible to buy the



proper size return bends, I believe they could be easily made from the same size tubing as used in the coil, and by swedging the ends to fit over the coil tubes, thus making a strong splice or union. Soldering with a good grade of solder, or with silver solder would make a practically safe joint under any working pressure encountered. It must be remembered, however, that in removing the float chamber, you are removing considerable surface from the coil, and it would, therefore, probably be necessary to add additional coil to make up for this loss.

NORGE LOSES OIL

QUESTION 258. What is wrong with the Norge system that loses its oil pretty fast and continually burns out seals? The particular Norge in question happened to be a commercial job.

ANSWER: I believe that, in all probability, the trouble that this particular man had was due to having the head on the compressor on the wrong way. Probably you are familiar with the fact that the head that goes on the top of the Norge rotary compresssor can be put on either way around, as there are six cap screws to hold it on. It can be put on the right way or the wrong way. If it is put on wrong, the gas going up through the compressor will carry the oil out of the compressor through the discharge line and will leave the compressor dry of oil. In that case, it will burn out the seal very quickly and cause numerous other troubles.

SUPERHEAT DEFINED

QUESTION 259. What is meant by different degrees of superheat in a thermostatic expansion valve? How about the different degrees used, three degrees superheat, six or nine or ten or twelve?

ANSWER: Superheat related to a thermostatic expansion valve is generally taken as being the difference in temperature between the bulb and the evaporation temperature that the valve gives you. In other words, if we have a valve set with a 32-degree temperature in our thermostatic bulb, it gives us an evaporation temperature of 22 degrees; we say we have 10 degrees of superheat. Whether we actually have 10 degrees of superheat in our tube or not is doubtful. In fact, I would just say we don't, because actually our refrigerant evaporates at 32 degrees and will warm up as much as five degrees. If it evaporates at 22 and warms up at 27 and that refrigerant is perhaps in the tube at 27, the outside of the tube or bulb certainly will not be more than five degrees different from the refrigerant temperature inside.

That also depends on how big a machine you have and how fast you are pulling your gas through there. But in relation to the thermostatic expansion valve, by superheat we mean the difference in temperature between the thermostatic bulb and the evaporating temperature in the system.

For different thermostatic valves and for different applications they may require different degrees of superheat. In general, I believe it will run somewhere in the neighborhood of five or ten degrees; probably

higher in some cases. Occasionally, in some installations we may want considerably more than ten degrees of superheat. If any of you have had experience with these ice cream coolers, where you have a water cooler in connection with it, we may set the thermostatic valve for a high degree of superheat and locate the bulb on the evaporator coil and water bath, and we have such a high degree of superheat that only a small part of the tube actually works. We can control the operation of the thermostatic valve from the bulb, which may have as much as thirty degrees superheat.

In some cases where you have extremely low temperature work, it may be advisable to have less than ten degrees of superheat, sometimes as low as five. I would think in most cases five would be the lower limit.

If we have a valve set for a low superheat, it may compensate in some manner for a drop in pressure through the evaporator coil. If we have a drop in pressure, if we have a valve set for low superheat, it may compensate for that. If we have too much drop in pressure, one of these equalizers on the thermostatic expansion valves does a better job.

The History of

Sulphur Dioxide for Refrigeration*

THE original assignment for this paper is covered by the title, "The History of Sulphur Dioxide for Refrigeration Uses." It was later expanded to include methyl chloride, but I have chosen to ignore the expansion because I believe it is a subject that can well be handled in a separate paper and I am quite sure that the man chosen for the task should be Tom Coyle of R & H Chemicals Division of Du Pont. I find that two related papers have been presented in the past, one entitled, "Liquefied Sulphur Dioxide," by F. A. Eustis and the other entitled, "Comparative Properties and Merits of Common Refrigerants," by A. H. Eustis. I believe that both of these papers have been made available to the members of this Association. In this paper, therefore, I will attempt to eliminate much of the information that has been presented to you heretofore and will endeavor to convey to you some additional information that I hope will be interesting.

MacIntire in his book entitled, "The Refrigeration Engineer," makes the statement, "In 1876, Raoul Pictet, devised the sulphur dioxide compressor, using water to cool the pistons and piston rods as well as the cylinder." This seemed to be the generally accepted beginning of the present day sulphur dioxide compression refrigerating machine. In this country, from 1900 on, there was considerable experimental work on a small sulphur dioxide machine that could be used in the home, or for the other fractional tonnage work. During this period, the "Audiffren" machine was devised by Abbe Audiffren of Grasse, France. This was a rather novel machine, the unusual feature being two revolving, oval shaped chambers which gave it its nickname "Dumb-bell" machine. This unit was put into production in this country by the H. W. Johns-Manville Company in 1912, the production work being handled by the General Electric Company at their Fort Wayne plant. This work was largely under the supervision of two of the early pioneers in sulphur dioxide refrigeration, Clark Orr and Howard Miller of the General Electric Company. They continued this work up to about the time that they were ready to go into production on their own household machine.

One would naturally suppose that interest in this new industry would be shown by the manufacturers of the larger tonnage machines, or the manufacturers of ice or the manufacturers of ice boxes. As a matter of fact, these three groups either more or less ignored the new industry, or in some cases were somewhat antagonistic. It was left to the manufacturers of automobile and automotive parts to give this industry its first push and to become the dominating factor in it. The first financial backing can undoubtedly be credited to H. B. Joy, who was Chairman of the Board of the

* Presented by H. V. Higley, Ansul Chemical Company, before the 25th annual meeting of the Compressed Gas Manufacturers' Association, New York, January 18, 1938.

Packard Motor Car Co. He brought with him a number of Packard engineers, including C. L. McCuen. Their problem was fourfold. First, they had to produce an absolutely automatic machine, one that would require little attention over a long period of time, and further, one that would be practically fool-proof. Second, the machine had to be leak-proof, in order that the refrigerant would not be lost over an extended period of time. Third, in order to compete with ice, they had to give primary consideration to low cost of operation. And fourth, they had to devise a system of distribution for sales as well as an educated service department throughout the country that would see that the machines were quickly repaired if they for any reason, ceased to function.

Pioneer Experimental Engineers

Two of the early pioneer experimental engineers were Fred Wolfe and Fred J. Heideman of the Mechanical Refrigerator Co. of Chicago, who developed from 1912 to 1916, the first electrically-driven automatic mechanical refrigerating machine for domestic installation. They manufactured approximately 75 of these machines, which embodied a conventional one cylinder reciprocating compressor, air-cooled and belt driven. Isko, Inc. was formed in April, 1916, by H. B. Joy and A. Y. Gowan, and they immediately bought out the Mechanical Refrigerator Co., its machines, patents, machinery, dies, jigs, etc. This unit was not produced in large quantity and there was continuous experimental work carried on. In general, these machines were direct expansion, with the condensing unit mounted on top of a board and the cooling coils suspended from the under side of the same board. The idea was to cut a square hole in the top of any ice box and merely place the unit on top, with the cooling coil thus suspended in the ice chamber. On the condensing unit, air cooling was accomplished by means of a continuous length of copper tubing wound in a rectangular shape and fastened at the four corners of the board, forming a guard for the unit. Its appearance gave it its nickname, "the bird cage" unit. Otherwise, it was known as the C-B or coil-belt series.

If you will pardon a personal reference, I was chief chemist for Isko during those early days and therefore saw not only much of the growing pains of this new industry, but through the later connection in the manufacture and sale of sulphur dioxide, have been privileged to keep more or less in constant touch with subsequent developments.

In 1916, Isko secured rights in the Dolmelre patent and produced about 450 units. This unit had an eight-cylinder reciprocating compressor of the eccentric rotating cam type (similar in design to the Gnome aeroplane engine). This was discontinued and about 500 machines were manufactured with a two-cylinder reciprocating compressor with eccentric type crank shaft. This type caused considerable difficulty in operation, and the compressor was changed to a two-cylinder conventional reciprocating type. Another change was the substitution of a radiator type condenser for the coils previously used, and the series was called R-B for radiator-belt. About 1,500 were manufactured and many of them remained in operation for many years.

In April, 1918, Isko purchased a controlling interest and exclusive rights in the use of the rotary herringbone gear compressor from the Leonard Pump & Motor Co. and Dr. Herbert Parkyn. They promptly added over $5,000,000 in capital, moved the plant to Chicago, manufactured the unit on a large scale and eventually went bankrupt. During this time, they had taken out many basic patents for this industry. It is surprising how few changes have been made fundamentally in the general design and operation of these machines during the following years, although of course, there has been no end of refinement that gives the reliable and efficient operation characteristic of today's machines.

Why Sulphur Dioxide Was Chosen

A question that might be asked is, "Why was sulphur dioxide picked for a refrigerant for these machines?" My answer would be, that it was because sulphur dioxide was and is the ideal refrigerant for a domestic machine and for small commercial installations. Its advantages might be summarized as follows:

1.—It is non-explosive and non-inflammable.
2.—It operates with low head pressures, permitting air cooling.
3.—It lends itself to perfect lubrication.
4.—It is ideal from a leak detection standpoint.

5.—If it does escape, it acts as its own warning agent.

6.—It is an absolutely stable gas, not decomposing even in the presence of a flame.

7.—It is a low cost chemical, due to the fact that there is a considerable production for other than refrigeration uses.

8.—Low pressure permits light construction, with resulting low cost.

9.—When dry, it will not react with any of the usual metals found in machine construction.

Every refrigerant that has ever been devised or discovered by man, has both its good points and its bad points. Fortunately, we know definitely of all the bad characteristics of sulphur dioxide as a refrigerant, and all of them are subject to control. Perhaps its greatest disadvantage is its corrosive nature if it becomes mixed with water. This difficulty, however, has been handled with complete success by the manufacturers of the sulphur dioxide and the machines. Secondly, there is no doubt but that its pungent odor is objectionable. However, this same odor makes its presence known when there is as little as five parts per million in a room. Not only does this give adequate warning from a safety standpoint, but also it immediately notifies the owner that his refrigerating machine is not operating properly and correction can be made before he is without refrigeration. One of the disadvantages has been listed as its toxic character. A great percentage of what has been written and said indicating that this refrigerant is dangerous can be classed as "bunk." Certainly, the best proof of the hazards involved is the fact that millions of these machines have been in operation, many of them eight and ten years, with practically a clean record as far as any fatalities are concerned. Our views on this point are expressed in a pamphlet which we will be glad to send any who are interested if they will merely request a copy from the Ansul Chemical Company.

Kelvinator Enters the Field

The Kelvinator Corporation came into the picture shortly after Isko, and the Nizer Corporation, who specialized entirely on the manufacture of a unit for ice cream cabinets, were also among the pioneers. Frigidaire was started in Detroit in 1916 as the Guardian Frigerator Co., but it did not really get under way until about 1926 after it was taken over by General Motors and moved to Dayton. General Electric came into the field very shortly after in 1927.

I find it absolutely impossible to try to list the various companies that contributed much to the development of the domestic refrigerating machine, which parallels to a considerable extent, the history of sulphur dioxide in refrigeration. I find myself inclined to mention many men who form an inseparable part of this history. However, there is too much danger of omissions and such omissions would be very unfair. During the development period, which of course is still going on, there have been many improvements, including the refinement of the refrigerant, the development of a pure and dry oil that would operate most satisfactorily, the elimination of porous castings, the development of new types of fittings, solder, etc.

After the original Isko unit, perhaps the next step forward was in the development of the flooded type as compared with the direct expansion type. As stated before, Isko had been selling their machines for installation on any ice box. It was soon discovered that most of the boxes in the homes were in very bad condition and were very poorly insulated. Gradually, this difficulty was eliminated by the production of well-insulated boxes. Also about this time, the manufacturer of the machine definitely combined his unit with the refrigerator and sold the combination.

Introduction of Multiple Systems

An early development was the use of multiple installations, where one condensing unit would operate cooling coils in several boxes. While this was an important development from an economy standpoint, it has been since found undesirable because of the poor installations that were made and some of the difficulties that resulted.

Commercial installations soon became important as people were interested in water and beverage coolers, ice cream cabinets, meat and florist boxes, and similar installations.

The next step was the production of the all-steel box, which has undoubtedly done more than anything else toward selling the housewife from a beauty and sanitation standpoint.

From a mechanical standpoint, the introduction of a rotary unit, the Rollator, by

the Norge Corporation in about 1927, was very important. About the same time, General Electric offered what was probably the first hermetic sealed unit, the chief advantage being that it cannot be serviced in the field by those who are not properly equipped.

A later development was the unit manufacturer, who specialized on a condensing unit, selling his product to those who wanted to assemble and sell a refrigerator or commercial box under his own name and according to his own particular design.

During these later years, machines and refrigerators have been equipped with many selling gadgets, some with merit and some in the class with "free wheeling." The more usable of these would undoubtedly include the cold control, super-shelf spacing, lights that go on when the door is opened, special dishes for special purposes, pedal-operated door, etc.

Up to 1925, about 75,000 units had been sold. During 1925, this number was doubled and the official figures for sales from that time on are as follows:

1926—210,000	1932— 840,000
1927—390,000	1933—1,080,000
1928—560,000	1934—1,390,000
1929—840,000	1935—1,688,000
1930—850,000	1936—2,175,000
1931—965,000	1937—2,520,000

We are told that the cumulative sales to date of household machines are 13,658,000, of which about one million have been exported. The official estimate of retirement is about 1,170,000. It is interesting to note that if this is true, there must be about one million machines that have been in service for eight years or more and as most of these were sulphur dioxide machines, it certainly speaks well for sulphur dioxide as a refrigerant. After deducting a quarter of a million machines that are in the hands of distributors and dealers, and also deducting those that have been retired, it is estimated that there are 11,271,000 machines in use in the United States at this time. This would mean 49.4 per cent of the 22,800,000 wired homes in the United States.

In the order in which they came into this industry, the manufacturers of sulphur dioxide in this country are the Ansul Chemical Company, Marinette, Wis., the Virginia Smelting Company of West Norfolk, Virginia, the Du Pont Company at Carney's Point, New Jersey, the Calco Chemical Company at Bound Brook, New Jersey, and Great Western Electro-Chemical Co. at Pittsburg, California. Because manufacturers must supply not only the manufacturers of refrigerating machines but also those who are making installations and providing service in the field, a wide variety of sizes of cylinders are made available and local distribution is provided in all cities of any consequence. The Ansul Chemical Company has cylinders that hold 5, 10, 25, 70, 100 and 150 lbs. respectively. They also have the ton drum which is shipped on multiple unit tank cars to large tonnage users.

Sulphur dioxide is also shipped in a single unit tank car holding 40,000 lbs., but these shipments are only made to users in the commercial field, as distinguished from refrigeration work. In passing, we might mention some of the commercial uses such as fruit bleaching and preservation, reduction of chrome liquor in tanning, bleaching of grain (patented process), refining of oils, manufacture of hydrosulphite, sugar bleaching, treatment of grapes, as an antichlor, and in any process where sulphurous acid is involved. There are, of course, many industries where it is impossible to sell the liquefied sulphur dioxide because it is far too expensive as compared with the burning of sulphur.

With no expansion of facilities, the present manufacturers of sulphur dioxide could undoubtedly triple the entire country's present production if they were permitted to do so by the development of new uses or the extension of present uses. I do not have the latest figure of production, but it would be my estimate that today, one-half of the production is being sold for refrigeration uses and one-half for commercial uses.

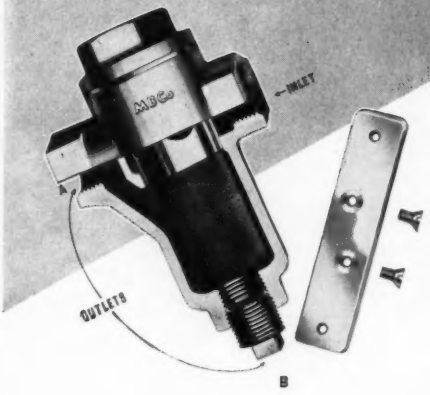
Merle Lambert
Ohio

Find enclosed check for $3.75, for one year subscription to THE REFRIGERATION SERVICE ENGINEER, one binder for same, and my balance of 50c. The magazine is okay.

Robert E. Walker,
California.

Enclosed is order for $2.00 to renew my subscription to THE REFRIGERATION SERVICE ENGINEER. I have received much valuable information from it and appreciate such things as the reference tables.

"TIME TESTED" REFRIGERATION PRODUCTS



WATER STRAINER

Specifications—Body, Specially Processed Dense Bronze Casting. Screen, 100 Mesh Welded Monel 5¼" Area.

● The new Water Strainer may be used for either straight through or angle installations on water or refrigerant lines by plugging out (A) or (B) as desired. Cap and screen are readily removed—easily accessible for cleaning.

This strainer is furnished with steel mounting plate and screws. On copper pipe installations, where rigidity may be required, the mounting plate may be used to fasten strainer to wall or other convenient location. Threaded adapters are used with copper pipe. Mounting plate is not required with rigid, threaded pipe.

Catalog No.	Description
A-13658	⅜" Female Pipe Thread
A-13660	¼" Female Pipe Thread

LIQUID LINE FILTER—

The small refrigerant liquid line filter has the improved cone-shaped strainer screen with a generous 3½ sq. inches of 100 Mesh Monel Screen. The cone strainer is packed with wool to filter fine particles from refrigerant line. It is furnished in the following sizes:

Catalog No.	Description Inlet	Outlet
A-13661	¼" Male Flare	¼" Male Flare
A-13691	⅜" Male Flare	⅜" Male Flare
A-13692	¼" Fem. Flare	¼" Male Flare
A-13693	⅜" Fem. Flare	⅜" Male Flare
A-13694	¼" Male Flare	¼" Male Flare

MUELLER BRASS CO.

PORT HURON, MICHIGAN, U. S. A.

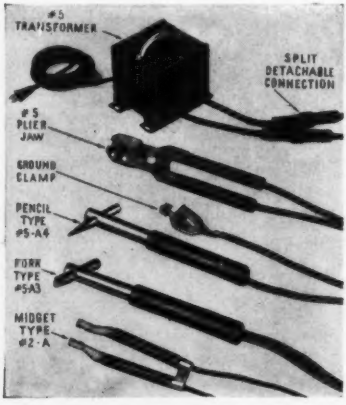
NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

IDEAL COMMUTATOR INTRODUCES NEW ALL-PURPOSE ELECTRIC SOLDERING UNIT

A NEW all-purpose "Deluxe" Thermo-Grip soldering unit for all types of soft soldering work has recently been introduced by the Ideal Commutator Dresser Company, 1093 Park Avenue, Sycamore, Illinois. Operating electrically, the unit eliminates the necessity of using an open flame.

The complete soldering unit consists of a transformer and four heads or tools. Simply plug into any A.C. supply and it is



THE COMPLETE SOLDERING KIT

ready for use immediately. All current carrying parts are fully insulated, which makes this new device completely safe.

A "Midget" Type Head is especially adaptable for small and lighter soldering and for use in restricted spaces. It is designed for soldering small terminals and lugs up to 150 amp. size, or sweating threadless copper tubing and fittings up to 3/8 inch diameter.

For more common soldering work the "Standard" Type Head is recommended. It is designed for applying and removing soldering lugs and terminals up to 400 amp. size, up to 1 inch copper pipes and fittings, making stator connections, heating solder cups, etc.

The "Fork" Type Head is handy for heating small lugs, terminals and connections which it would be impossible to reach with other tools.

The "Pencil" Type Head is adaptable for soldering seamed joints, spot soldering, and for getting into "tight" places. This head is a single-pointed, round carbon rod and is used in the same manner as a welding rod.

On soldering jobs where speed is particularly necessary, a new foot-operated switch is available. This may be used with all "Thermo-Grip" Tools.

This switch saves current—releasing the foot pedal cuts current off automatically, leaving both hands free for handling the tool and to work.

NEW UNIVERSAL PURGING AND CHARGING VALVE SET FOR HERMETIC UNITS WITH GAUGE CONNECTION INDEPENDENT OF SERVICE CONNECTION

A RECENT addition to Kerotest Manufacturing Company's line of refrigeration accessories is a Master Purging and Charging Valve Set designed to fit practically all makes of hermetic refrigeration units.

This set contains the operating valve, adapters and stem extensions for servicing various makes of hermetically-sealed units and makes it unnecessary for the service man to carry a separate valve for each unit.

It is packed in a convenient box to facilitate carrying in the serviceman's kit. Adapters and stem extensions are plainly marked, and the label inside the box shows which adapter to use with each of the various units.

The master valve is furnished with a handle eliminating need of a wrench and any

CHECK WEATHERHEAD FIRST

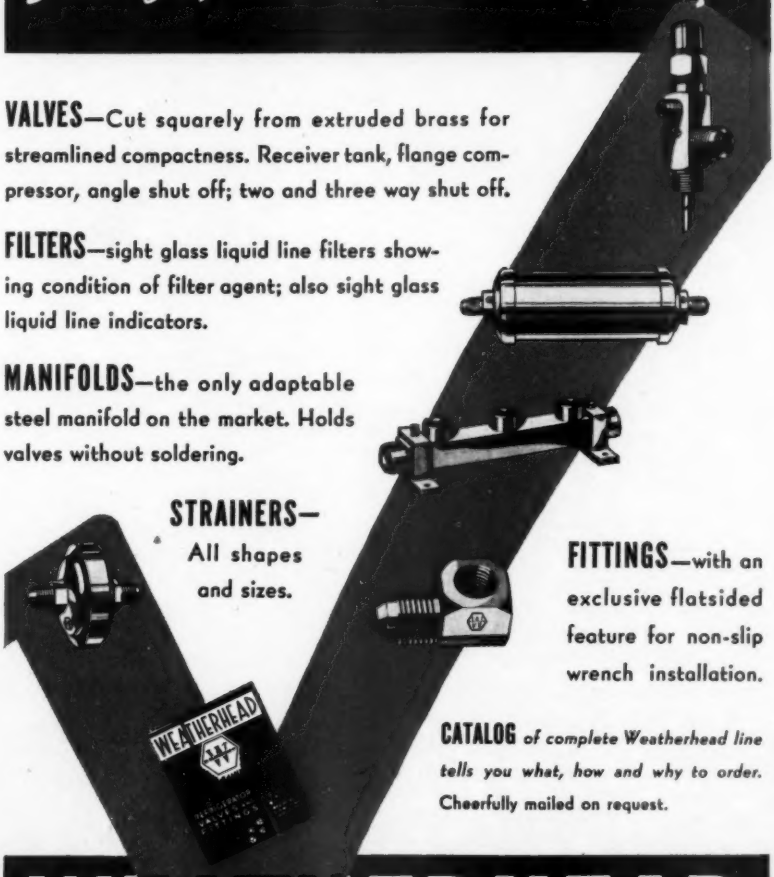
for Refrigeration Valves and Fittings

VALVES—Cut squarely from extruded brass for streamlined compactness. Receiver tank, flange compressor, angle shut off; two and three way shut off.

FILTERS—sight glass liquid line filters showing condition of filter agent; also sight glass liquid line indicators.

MANIFOLDS—the only adaptable steel manifold on the market. Holds valves without soldering.

STRAINERS—
All shapes and sizes.

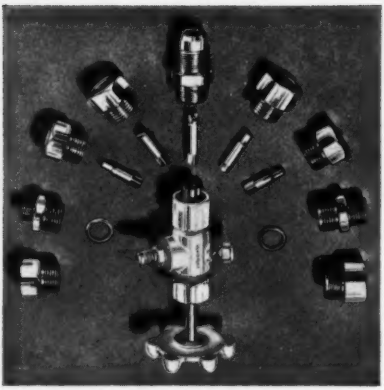


FITTINGS—with an exclusive flatsided feature for non-slip wrench installation.

CATALOG *of complete Weatherhead line tells you what, how and why to order.* Cheerfully mailed on request.

WEATHERHEAD

CLEVELAND • OHIO



UNIVERSAL PURGING AND CHARGING VALVE SET FOR HERMETICS

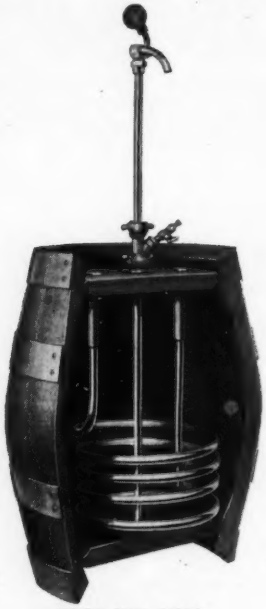
possibility of damaging the stem square. A gauge connection, independent of the service connection, is also included in its construction—an important factor from both a service and safety standpoint.

To use the set, the sealing plug is first removed from the hermetic unit. The correct adapter is attached and the stem extension inserted if needed. The operating valve is then attached to the adapter and the unit may be charged, purged, etc.

The Kerotest Universal Set may be used on any of the following hermetically-sealed units: Westinghouse (large and small float), U. S. Radio and Television, Bohn SO_2 and Methyl Chloride, Coldspot, Trukold, Gibson, Grunow, Sparton, Crosley, Frigidaire (high side float), General Electric (Junior and Standard), Hotpoint (late models) and Airtemp.

THE "KOOLER-KEG" SYSTEM

AN interesting method of beer cooling has been developed by the Kooler-Keg Division of the Novadel-Agene Corp., in



TYPE KEG USED

Belleville, N. J., a branch office of which company has recently been opened in Chicago, at 807 W. Washington Blvd.

The system employs the convection type of system, cooling a sweet water bath. A small centrifugal pump, operated by a ⅛-hp. Century motor, circulates the sweet water

A TEST SET-UP OF THE "KOOLER-KEG" SYSTEM SHOWING ALL THE EQUIPMENT NECESSARY

through two one-inch copper tubes, contained in cork-insulated wooden casing, to the coil in the keg. A rate of flow of 5 gallons per minute is obtained, which maintains a temperature of 40 degrees on the beer. A Cutler-Hammer temperature control, with a red bull's eye in the door of the circulator warning the customer when the sweet water bath is above 40 degrees, operates the circulator motor, and a Minneapolis-Honeywell temperature control controls the condensing unit and, in turn, the temperature of the bath. Liquid carbonic gas is recommended as the most pure means of pressure on beer dispensing. Contrary to the belief of a majority of servicemen, the beer does not remain in the tap rod, because the temperature of the room builds up a pressure in the faucet greater than the pressure in the keg, and the beer will, therefore, return to the keg. The tap rod is constructed of 5/8-inch brass casing, with an inner tube of 3/16-inch copper. Both inner tubes, casings and faucets are German silver, plated all the way through. A vacuum has been drawn on this outer casing and hermetically-sealed. It is a very simple operation to draw a perfect glass of beer of any size head at any time you wish.

WORLD'S FIRST AIR CONDITIONED TELEPHONE BOOTH IN OPERATION

THE world's first air conditioned telephone booth is the feature today in a local bank.

When the Carrier air conditioning system was installed in the First Federal Savings and Loan Association building, in Atlanta, Ga., engineers extended the installation to include a lobby telephone booth—the smallest space ever air conditioned for public comfort.

Foremost engineering problem involved in air conditioning such a small space was the control of the circulation of the conditioned air. A special outlet grille was placed in the top of the booth and the speed of the air released was checked in the ducts by an improvised "air brake."

A continuous supply of fresh air is poured into the booth and humidity and temperature are regulated to balance the heat load thrown off by the human body in the small space.

The booth air conditioning is an extension of a system installed by Carrier for the entire banking space, including the directors' room, mezzanine and second floor.

Chapter Directory

REFRIGERATION SERVICE ENGINEERS' SOCIETY

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

NATIONAL OFFICERS—1938

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FIRST VICE-PRESIDENT

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SECOND VICE-PRESIDENT

G. A. BURNS.....45 Glenmanor Drive, Toronto, Ont., Canada

TREASURER

S. A. LEITNER.....3112 Holmes Street, Kansas City, Mo.

SECRETARY

H. T. MCDERMOTT.....433 N. Waller Ave., Chicago, Ill.

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AKRON CHAPTER NO. I, AKRON, OHIO: Meets on 1st and 3rd Tuesdays of each month at 10 Cherry St. President, Charles Hall; Secretary, P. G. Hansen, 973 Mercer Ave., Akron, Ohio.

BINGHAMTON CHAPTER NO. I, BINGHAMTON, N. Y.: Meets on 2nd and 4th Tuesdays during winter and 2nd Tuesday of each month during summer. President, F. C. Landon, 30 Massachusetts Ave., Johnson City, N. Y.

BOSTON CHAPTER, BOSTON, MASS.: Secretary, Arthur Burke, 13 Winchester St., Medford, Mass.

CAPITAL CITY CHAPTER NO. I, WASHINGTON, D. C.: Meets on 1st and 3rd Fridays of each month. President, Neil Matheson; Secretary, M. H. Hamilton, 1522 Isherwood St., N. E., Washington, D. C.

CENTRAL INDIANA CHAPTER NO. I, INDIANA: Meets 2nd Wednesday of each month. President, J. L. Rogers; Secretary, Herbert Hale, 620 W. Jefferson St., Kokomo, Ind.

CENTRAL NEW YORK CHAPTER NO. I, SYRACUSE, N. Y.: Meets on 2nd and 4th Mondays of each month at 304 Seymour St., Syracuse. President, H. A. Persett; Secretary, M. H. Schwartzberg, 512 E. Taylor St., Syracuse, N. Y.

CHICAGO CHAPTER NO. I, CHICAGO, ILL.: Meets on 2nd and 4th Tuesdays of each month at Medinah Club. President, F. H. Roth; Secretary, H. J. Long, 5623 S. Ada St., Chicago.

CINCINNATI CHAPTER NO. I, CINCINNATI, OHIO: Meets on 2nd Friday of each month. President, J. J. Stubbers; Secretary, H. G. Klugman, 2727 Scioto St., Cincinnati, Ohio.

CLEVELAND CHAPTER NO. I, CLEVELAND, OHIO: Meets on 2nd and 4th Thursdays of each month at Sterling Hotel. President, W. E. Wright; Secretary, R. D. Chown, 14102 Parkdale Ave., Cleveland, Ohio.

COLONELS CHAPTER NO. I, LOUISVILLE, KY.: President, W. H. Eickmeyer; Secretary, A. M. Burbank, 904 S. Third St., Louisville, Ky.

COLUMBUS CHAPTER NO. I, COLUMBUS, OHIO: President, L. E. Mack; Secretary, R. E. Yeager, 71 Eldon Ave., Columbus, Ohio.

DAYTON CHAPTER NO. I, DAYTON, OHIO: Meets every other Friday. President, E. O. Bowman; Secretary, Geo. O. Snyder, R.R. 5, Box 224, Dayton, Ohio.

DES MOINES CHAPTER, DES MOINES, IOWA: 1st and 3rd Tuesdays of each month. President, B. F. Wood; Secretary, E. A. Laverrenz, 7200 W. Douglas Ave., Des Moines, Iowa.

INDIANAPOLIS CHAPTER NO. I, INDIANAPOLIS, IND.: Meets on the 2nd and 4th Tuesdays of the month on the 14th floor of the Lincoln Hotel. President, J. O. Cummings; Secretary, J. A. Salter, 3607 E. Michigan St., Indianapolis, Ind.

KANSAS CITY CHAPTER NO. I, KANSAS CITY, MO.: Meets on 2nd and 4th Tuesdays of month at Commonwealth Hotel. President, T. L. Anderson; Secretary, S. A. Leitner, 3112 Holmes St., Kansas City, Mo.

LONG BEACH CHAPTER NO. I, LONG BEACH, CALIF.: President, L. S. Gould; Secretary, E. L. Murphy, 459 St. Louis Ave., Long Beach, Calif.

LOS ANGELES CHAPTER NO. I, LOS ANGELES, CALIF.: President, W. W. Allison; Secretary, John Lewis, 5728 Deane Ave., Los Angeles, Calif.

MADISON CHAPTER NO. I, MADISON, WIS.: Meets on 1st and 3rd Tuesdays of month. President, Mead Robertson; Secretary, Phil Noth, Route 1, Madison, Wis.

MAGNOLIA CHAPTER NO. I, JACKSON, MISS.: President, Jos. L. Frost, 195 Wacaster St., Jackson, Miss.

MEMPHIS CHAPTER NO. I, MEMPHIS, TENN.: Meets every Wednesday. Secretary, J. H. Riehlmann, 3077 Summer Ave., Memphis, Tenn.

MILWAUKEE CHAPTER NO. I, MILWAUKEE, WIS.: Meets 1st and 3rd Tuesdays at Metropolitan Hotel. President, H. H. Felker, 4510a No. 41st St., Milwaukee, Wis.

MISSISSIPPI VALLEY CHAPTER NO. I, DAVENPORT, IOWA: Meets 2nd and 4th Fridays of month. President, L. Nelson; Secretary, E. L. Bengston, 116 E. First St., Davenport, Iowa.

MISSOURI VALLEY CHAPTER NO. I, OMAHA, NEBRASKA: President, C. J. Doyle; Secretary, P. O. Jones, 2014 N. 16th St., Omaha, Nebr.

MONTGOMERY CHAPTER NO. I, MONTGOMERY, ALABAMA: President, B. G. Allen; Secretary, C. C. Collins, 222 Dexter Ave., Montgomery, Ala.

MOUNT ROYAL CHAPTER, MONTREAL, QUE., CANADA: President, J. A. Tremblay; Secretary, J. A. St-Laurent, 350 Victoria Ave., Westmount, Que., Canada.

NIAGARA FRONTIER CHAPTER NO. I, BUFFALO, N. Y.: Meets 2nd and 4th Wednesdays of month. President, D. B. Schuster; Secretary, R. D. Davis, 117 William St., Buffalo, N. Y.

ONTARIO FOREST CITY CHAPTER, LONDON, ONT., CANADA: 1st and 3rd Fridays. President, W. Bevis; Secretary, R. A. Campbell, Box 398, London, Ont., Canada.

ONTARIO MAPLE LEAF CHAPTER NO. I, TORONTO, ONT., CANADA: Meets 2nd and 4th Fridays at King Edward Hotel. President, A. E. Doan; Secretary, H. F. Nye, 80 Ontario St., Toronto, Ont., Canada.

PITTSBURGH CHAPTER NO. I, PITTSBURGH, PA.: Meets 2nd Friday of month at Commonwealth Building. President, E. V. Black; Secretary, F. V. Golitz, 1109 Pemberton St., Pittsburgh, Pa.

ROCKFORD CHAPTER NO. I, ROCKFORD, ILL.: Meets 1st and 3rd Mondays of month at the Nelson Hotel. President, R. C. McCarthy; Secretary, W. W. Larson, 1120 Tenth Ave., Rockford, Ill.

ST. JOSEPH CHAPTER NO. I, ST. JOSEPH, MO.: President, E. J. Storm; Secretary, H. E. Young, 305 S. 6th St., St. Joseph, Mo.

ST. LOUIS CHAPTER NO. I, ST. LOUIS, MO.: Meets 2nd and 4th Thursdays at German House, 2345 Lafayette St. President, L. L. Vollman; Secretary, E. A. Plesskott, 2145 67th St., St. Louis, Mo.

SCRANTON CHAPTER NO. I, SCRANTON, PA.: President, Wm. Franklin; Secretary, C. G. Hess, 321 N. Everett Ave., Scranton, Pa.

TOLEDO CHAPTER NO. I, TOLEDO, OHIO: Meets 3rd Wednesday of month at Toledo Edison Service Bldg. President, A. J. King; Secretary, H. C. Benington, 139 N. Erie St., Toledo, Ohio.

TRI-COUNTY CHAPTER NO. I, ILLINOIS: Meets 2nd Monday of month in Elgin, Aurora and Joliet, Illinois, respectively. President, Eugene White; Secretary, Willis Stafford, 726 Hinman St., Aurora, Ill.

TRI-STATE CHAPTER NO. I, HUNTINGTON, W. VA.: Meets 1st Monday of month from May to October, and from October to May on the 1st and 3rd Mondays. President, C. A. Brunton; Secretary, A. W. Albertsen, 206 W. 8th Ave., Huntington, W. Va.

TWIN CITIES CHAPTER NO. I, MINNEAPOLIS AND ST. PAUL, MINN.: Meets 2nd Tuesday of month at the Midway Y. M. C. A. at 1977 University Ave., St. Paul. President, A. E. Johansen; Secretary, B. J. DeLange, Como Station, Route 3, St. Paul, Minn.

VULCAN CHAPTER NO. I, BIRMINGHAM, ALA.: President, Sandy Nelson; Secretary, E. D. Gothberg, R. 2, Box 225a, Birmingham, Ala.

WICHITA CHAPTER NO. I, WICHITA, KANSAS: 1st and 3rd Fridays. President, F. W. Ryan; Secretary, F. H. Richards, 115 S. Minneapolis Ave., Wichita, Kansas.

WYOMING VALLEY CHAPTER, WILKES-BARRE, PA.: President, F. M. Schultz; Secretary, E. E. Swank, 35 Ross St., Ashley, Pa.

YOUNGSTOWN CHAPTER NO. I, YOUNGSTOWN, OHIO: Meets the 1st and 3rd Monday of month at the Central Y. M. C. A. President, M. Bokesch, Sr.; Secretary, Martin Bokesch, Jr., 2328 Mahoning Ave., Youngstown, Ohio.

PRESIDENT MOSS PRESENTS VULCAN CHAPTER WITH CHARTER

ON April 6th the first meeting of Vulcan Chapter No. 1 of Birmingham, Alabama, was held at the Bankhead Hotel, at which time our President—W. H. Moss of Memphis—was in attendance to assist in the establishment of the chapter on a permanent basis and to present the charter.

Presiding over the meeting was Mr. Sandy Nelson, president of the Vulcan Chapter, with all of the charter members and twenty-six guests from various distributors and local utilities companies present.

Mr. Moss addressed the chapter on the aims and objects of the Society and then presented the charter to President Nelson.

Other officers who were elected to serve as the first officers of the Vulcan Chapter include, in addition to Mr. Nelson, Mr. George D. Maske, *vice-president,* and Mr. E. D. Gothberg, *secretary-treasurer.*

Impromptu talks were given by "Buck" LaRochelle of the Flint Refrigeration Co., Cy Porter of R. P. McDavid and Co., Messrs. Brassfield, Robertson and Holmes of the Alabama Power Co., Larry Dewing of Peerless of America, Inc., and Bruce Allen, president-elect of the Montgomery (Alabama) Chapter of the R.S.E.S.

\$ \$ \$

TRI-STATE CHAPTER HOLDS FISH FRY

ON April 8th, because the Ansul Chemical Co. of Marinette, Wisconsin, had shipped Claude Brunton all the silver smelts there were in Wisconsin, Tri-State Chapter No. 1 of Huntington, W. Va. held a fish fry in the rooms of the K of P Lodge at 1118½ Third Ave.

All members, prospective members and their wives and sweethearts were invited. Fifty-eight were present, including an even dozen of the ladies, and the "Little German Band" from the Ashland High School of Ashland, Ky.

Red Harrison of Ashland, chairman of the Entertainment Committee, presided, and Dutch Gruber of Ironton, Ohio, was unable to get up from the table when called on for a speech.

A royal good time was had by all and it was a pleasure to see the good fellowship

that exists between the members of Tri-State Chapter.

Some of the ladies are meeting with Mrs. June Brunton on our next regular meeting night—April 18th—and, who knows, maybe Huntington will some day have a ladies' auxiliary.

S S S

OHIO STATE ASSOCIATION

A MEETING of the Ohio State Association was held April 2 and 3 at the Chittenden Hotel in Columbus, Ohio. A total of 125 attended, representing the chapters in Akron, Cleveland, Cincinnati, Columbus, Dayton, Toledo and Youngstown. The national organization was represented by Claude Brunton of Huntington, W. Va., George H. Clark of Detroit, and W. L. Drake of Indianapolis, Ind.

The banquet pictured on page 48 was held on April 2nd and the Columbus Chapter can be credited with arranging a very enjoyable evening. Major Irmie of the Columbus Dispatch was the speaker of the evening, giving a humorous and interesting talk on a recent trip through Russia and Europe. A floor show, dancing and refreshments rounded out the balance of the evening.

A business meeting called to order at 10:00 a.m. on April 3d by Mr. Charles Eich of Youngstown, was for the purpose of mapping a program for the future of the Ohio State Association.

Calling for suggestions from the group pertaining to a worthwhile future for the Association, President Eich obtained the following:

Advisability of inter-chapter meetings.

Selection of members according to qualifications rather than number of members.

Desirability of a central educational committee was discussed.

Discussion of time and place of future state meetings.

Suggestion was made that the Ohio State Association hold a state convention in October and a real vacation be planned for Ohio State members, who are unable to attend the national convention.

Mr. J. D. Merkle suggested that each chapter communicate its suggestion for the future of the O.S.A. to the President of the organization.

Frank Kading
Illinois

I am enclosing money order for a renewal subscription to R.S.E., and also for your handy binder.

I would also like to compliment you on your great little trade journal. I often wonder how you are able to keep it chuck full of such interesting and informative articles.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

TRI-COUNTY CHAPTER

March 14—The first speaker of the evening was a representative from the Risher Firebrick Co. of Chicago, who presented an interesting moving picture on the manufacture of firebrick and other refractory material.

Next on the program was Mr. Robert Stainton of the Minneapolis-Honeywell Regulator Co., who gave an illustrated talk on the various thermostats manufactured by his company.

Considerable discussion was devoted to the new Illinois State Chapter, a skeleton constitution and by-laws for the new organization being read by President E. White.

April 15—Catalogs of the Rockwood Belt Co. were distributed, and descriptive literature of their products read.

The meeting was then turned over to Mr. Willis Rees of the U. S. Gypsum Co., who presented a very interesting moving picture on the manufacture of glass wool. An educational discussion followed on the uses of this insulation in refrigeration applications.

The meeting was terminated with a smelt fry, which was the contribution of the Ansul Chemical Co.

CAPITAL CITY CHAPTER

April 6—Arrangements were made whereby students from refrigeration schools may apply for and receive a junior membership in the chapter. The arrangements provide that the student will not receive a member-

ship certificate or card and shall have no voice in the management of the chapter. They will receive the benefit of attendance at the meetings and will receive all printed matter sent out from the National Society. They will pay the regular initiation fee and dues, and upon qualifying for associate or active membership will not be required to pay a further initiation fee. The Secretary was instructed to notify the local schools of this arrangement.

DAYTON CHAPTER

April 13—Mr. T. C. Bickel gave a short talk on the benefits of membership in the Society, and then introduced Mr. L. C. McKesson of the Ansul Chemical Co. Mr. McKesson gave an hour of real education on various refrigerants, which was illustrated through the use of slides and moving pictures taken in the Ansul laboratory. His talk was very interesting and enjoyed by all.

April 27—Through a membership vote, it was decided that the meeting nights will be changed from Wednesday to Friday, starting May 13th.

The meeting was turned over to Mr. H. R. Shoupp, chairman of the Educational Committee, who led a discussion on service troubles and remedies. Mr. Shoupp also announced an interesting program for future meetings.

WICHITA CHAPTER

April 1—At this meeting an election was held to fill the offices which had not been filled at the original election of officers. Mr. G. B. Govits was elected vice-president, and Mr. J. E. Ambler was elected sergeant-at-arms.

For the benefit of the new members and visitors present, the constitution was read by President F. W. Ryan, and questions on same answered.

The question box was next opened and the questions answered, with considerable discussion from the floor.

ONTARIO FOREST CITY CHAPTER

March 18—The place of meeting was changed to accommodate a larger meeting than usual. There were approximately 85

in attendance, fifteen of whom were members of the Ontario Maple Leaf Chapter at Toronto. The members from the Toronto chapter were introduced to the meeting by Mr. Harry Parish.

Mr. Mel Knight, a representative of Peerless of America, Inc., of Chicago, was the speaker of the evening. Mr. Knight passed on a few hints on the advantages of belonging to the R.S.E.S. The Peerless products were explained and illustrated by motion pictures. The features of the Peerless three-inch fin coil for use in walk-in and reach-in coolers were explained, as well as the off-center coil, the household Humidi-Pack, Peerless flash cooler and their new development in the water-saver. Mr. Knight's address was very instructive and very much appreciated by all who were in attendance.

April 1—The speaker of the evening was Mr. R. A. Campbell. The refrigerating system used in the Sparton refrigerator manufactured in Canada by Sparton of Canada, Ltd., was outlined and explained. The Sparton refrigerator features automatic defrosting and fast freezing in addition to a number of other points. The dry expansion system employing the thermostatic expansion valve is used in this open-type unit.

TRI-STATE CHAPTER

April 4—It was announced that the Chase Brass Co. would put on a demonstration of soldering of hard drawn copper at the meeting of April 18th.

President C. Brunton introduced the speaker of the evening, Mr. R. V. Clark of the Penn Electric Switch Co., who gave a very instructive talk on Penn controls, illustrating it with an operating panel and display which he carried for the purpose.

Mr. Whisenhunt of Charleston advised they would try to get a group of service engineers in Charleston together within the next two weeks. Mr. Brunton volunteered to talk to them if they would notify him of the date of the meeting.

KANSAS CITY CHAPTER

April 12—Mr. J. DeWilde, chairman of the Educational Committee, announced that Mr. R. W. Young of the Mueller Brass Co. would be the speaker at the next regular meeting.

After a short business session, those members desiring to take the certificate examination were requested to remain, while the rest of the meeting adjourned. The examination was conducted by Mr. DeWilde.

April 26th. The Educational Chairman announced that the educational feature for the next meeting would be a general discussion and study of lessons 7 and 8 of the lecture course, also that Mr. Hataway would lecture to us on electric motors.

The meeting was turned over to Chairman De Wilde, who introduced the speaker of the evening, Mr. R. W. Young of the Mueller Brass Co., and an associate member of our Chapter, who gave a very interesting talk on his company's products. A display board with mounted parts and accessories was on hand for the inspection of their products by the members present.

Mr. Young also stressed the importance of selling parts and accessories, to bring up to date old equipment, and thereby increase incomes, and that new codes that some day will be passed, would require the installation of many parts and accessories, that are not now required.

Instructions and demonstrations of the correct way to use and solder stream line fittings was also made. The talk was very interesting, highly instructive and educational, and was very much appreciated by all attending the meeting.

ST. LOUIS CHAPTER

March 10—Mr. E. Gygax introduced the speaker of the evening, Mr. V. V. Netch of the Hill Equipment Engineering Co., local distributors for the Lincoln Electric Co. Mr. Netch's talk on the subject, "Analysis of Welded Joints" was comprehensively handled and supplemented by a polariscopic demonstration.

In recognition of his untiring efforts and the high esteem in which he is held, Mr. Gygax was presented with a G-E light meter by Secretary E. A. Plesskott. Mr. Gygax

expressed his appreciation and promised his continued cooperation.

March 24—Mr. L. Vollman introduced Mr. P. Domke of the Mueller Brass Co., who explained in detail the complete line of his company's products, together with the engineering problems behind them; also the new developments to cope with the codes of the various cities were shown and explained.

Mr. Domke then demonstrated the proper preparation and soldering of "Streamline" fittings, and his talk was concluded with the meeting being thrown open to questions and answers.

It was announced by Secretary Plesskott that George H. Clark of the Detroit Lubricator Co. would be in the city on the following Tuesday and if it were possible a special meeting would be called to hear a talk by Mr. Clark.

It was also announced that Peerless of America would supply a speaker and a film for the next regular meeting.

March 29—Special meeting. Business was dispensed with in order that as much time as possible could be devoted to a talk given by Mr. George H. Clark of the Detroit Lubricator Co. Mr. Clark explained in detail the theory, design and application of the Detroit Lubricator thermostatic expansion valve. His blackboard talk and crayon sketches were followed with interest by the two hundred present. At the conclusion of his talk he connected a valve with gauge and service drum and with the help of a thermos bottle filled with cracked ice gave a series of demonstrations showing how to check these valves for leaks, settings, etc.

April 14—Mr. M. W. Knight, general sales manager of Peerless of America, Inc., was introduced and gave an interesting story of his company's products, and exhibited a film taken by himself depicting a trip through the Peerless factory.

Announcement was made that for the May 12th meeting Socony-Vacuum Oil Co. would exhibit a film entitled, "Lubrication," and at the meeting of May 26th Dr. Walker of the Ansul Chemical Co. would give a talk on the Ansul Twins—sulphur dioxide and methyl chloride.

PITTSBURGH CHAPTER

April 8—The educational feature planned for the evening had to be postponed to a later date due to the fact that Mr. N. D. Wagener, the scheduled speaker, was not able to attend because of illness in his family. In place of this feature, a discussion on service problems and calls was held, which aroused considerable interest.

Two additional members, Mr. H. S. McCloud and Mr. V. C. Waight, were appointed to the Educational Committee.

MADISON CHAPTER

March 29—A committee was appointed to arrange for a banquet to be held in approximately two weeks. Plans for a picnic to be held in the near future were started and Mr. Ray Sweeney was elected as chairman of the

committee, and Mrs. Struthers and Mrs. Larson as assistants.

Mr. Edwards and Mr. Hauer of the Palco Wool Insulations Co. were then introduced. Mr. Edwards, with the aid of a talking attachment, proceeded with a movie on the complete story of Palco Wool and Redwood Bark insulations. The movie took the members present to the immense redwood forests of California, where the natural forest and the lumberjacks topping and cutting the trees could be viewed. The old and new methods of taking the logs to the mills were shown, as well as the barking processes and the way the lumber is sawed and finally the finished products produced, showing as an example Bing Crosby's home.

The movie held the interest of the assembly at a high intensity for at least an hour.

After the distribution of catalogs, additional pictures were shown of lockers actually in use and illustrations of their construction.

April 12—Through the courtesy of the Ansul Chemical Co. this meeting was devoted to a smelt fry. The members were required to pay a small fee for the additional trimmings, which included the beer. So much time was devoted to this pastime that there was little left for the business session.

Announcement was made that Peerless of America would present a 600-ft. film at the next regular meeting.

CENTRAL NEW YORK CHAPTER

March 28—The meeting was turned over to Mr. Phillips of the Detroit Lubricator Co., who gave an interesting talk on his products.

Mr. G. Graff of Ranco, Inc., was then introduced, who spoke at length on the controls manufactured by his company.

After adjournment, refreshments were served through the courtesy of Ranco.

MISSISSIPPI VALLEY CHAPTER

April 8—A letter from the Ansul Chemical Co. offering smelts for a fish fry was read by Secretary E. L. Bengston, and arrangements were immediately started to receive these fish and care for them until such time as the date could be set.

The educational speaker of the evening, who was to have been Mr. R. F. Polley of the Mills Novelty Co., it was learned had been stalled in a bad snowstorm and was unable to get to Davenport for the meeting. It was hoped that Mr. Polley would be able to attend a meeting at a later date.

April 22—After the regular business session of the evening during which various committees gave their reports of activities, some discussion arose as to future educational programs, and the Secretary was instructed to write to the Alco Valve Co. and ask that they send one of their representatives for a future meeting. A vote of thanks was extended to the ladies of the Auxiliary for their work in preparing the fish for the smelt fish supper which was supplied by the Ansul Chemical Co.

The Secretary was instructed to write to

the Iowa chapters to see if it would be possible to arrange a meeting for Sunday, May 29th, for the purpose of forming an Iowa State Association. Some discussion followed regarding the Illinois State meeting which was held in LaSalle, Illinois.

CLEVELAND CHAPTER

March 10—At this meeting the question box was donated by Mr. E. E. Vadakin.

Mr. Paul Domke and his assistants from the Mueller Brass Co., gave an interesting talk on their products and demonstrated the making of sweat-soldered joints.

Refreshments wound up the affairs of the evening.

March 24—To an attendance of approximately 90, Mr. J. L. Shrode, president of the Alco Valve Co., and Mr. Ken Way, presented a very interesting talk and demonstration on the products of their company.

The business of the evening was cut to a minimum to allow sufficient time for this educational program.

April 28—Designated as "Imperial Night." After dispensing with the regular business, President W. E. Wright turned the meeting over to Mr. George Franck, engineer of the Imperial Brass Mfg. Co.

With the cooperation of Mr. Karl Debes of Debes & Co., Cleveland jobber of Imperial, Mr. Franck gave a very interesting and educational talk stressing the completeness of the company's line and explaining the application and function of the various valves and tools.

After the meeting was adjourned the men were given the opportunity of trying the various tools and inspecting the valves and fittings displayed on the table. Refreshments were served. Approximately 75 men attended this meetting.

* * *

MISSISSIPPI VALLEY LADIES AUXILIARY

FORMED January 28th in a meeting held at the Davenport Hotel in Davenport, Iowa, and with an increased membership to a total of twenty-five, the Mississippi Valley Ladies Auxiliary has really been going places recently.

A president, vice-president, secretary and treasurer were elected at the original meeting and at a later meeting yearly dues of

$2.00 per member, with initiation fee of 25c, were inaugurated,—the funds to be used for the purpose of defraying expenses of meetings and entertainment.

A total of four meetings have been held to date at the homes of the members, combining business and social activities. Out of these meetings have come definite plans for future activities.

The latest social affair arranged by the ladies was the preparation of a smelt fish supper for the members and friends at the Peoples Light Auditorium in Davenport on Friday evening, April 22nd.

The members had the pleasure of having with them Mr. Bob Anderson of the Imperial Brass Mfg. Co. and Mr. Snell of the Modern Equipment Co., and an enjoyable evening was had by all.

The fish were sent to the Mississippi Valley Chapter through the kindness of the Ansul Chemical Co., and they were prepared by the members of the Ladies Auxiliary. It may here be said that the members of the Chapter were heard to say that they were very happy that they had a Ladies Auxiliary to fall back on to prepare these fish.—*Mrs. Harriet Berberet, Secretary.*

MILWAUKEE JOBBER VALUES DISPLAY

ONE of the attractive refrigeration parts jobbers' stores is that of the Refrigeration Specialty Company, 2043 W. Wells St., Milwaukee, Wis. Not only does the store have a modern appearance in its store front construction, but Mr. Lee F. LaDue, manager, has found that a parts store can be

A View of the Store Front and Window Display of the Refrigeration Specialty Co. Note the Display Panels at the Sides and the Extremely Well Lighted Interior

made as attractive by the judicious use of display, as any other type of merchandising establishment. Valves, fittings, tools, and numerous other items are attractively displayed on wallboard panels, indirectly lighted, and this idea is carried out in other parts of the store, such as counter displays, etc.

This organization covers the entire state of Wisconsin, and although about two and one-half years old, has found it necessary to increase its floor space several times.

A novel device, which has been designed, is a Check-O-Meter, which enables service engineers to immediately check valves.

Mr. H. A. Felker is in charge of counter sales.

S S S

J. S. FORBES HEADS NEW FITTINGS CONCERN

A NEW company has been recently formed, known as the Superior Valve and Fittings Co., located at 500 37th St., Pittsburgh, Pa., with Mr. J. S. Forbes as President, and Mr. K. M. Newcum as Sales Manager. Mr. Forbes, who was formerly Treasurer of the Kerotest Manufacturing Co., enjoys a wide acquaintanceship in the refrigeration industry.

The new company is equipping its factory for the production of diaphragm packless valves, manifolds, accessories and flare fittings. Among other things, Mr. Forbes was the inventor of the diaphragm packless valve, and the new company will announce shortly, a new valve of this type, incorporating some new features. The company is now in production on S.A.E. fittings and flare fittings, and is focusing attention on the final production details of the other items that will be included in their line.

Mr. Forbes has come successively through the ranks of the Kerotest organization, after returning from army service in 1919, from Assistant to the General Manager to his election as Treasurer and Director of the company in 1923.

Mr. K. M. Newcum, who during the past year has been doing editorial work, was previous to that connected with the Kerotest Company, as representative in the Eastern States, with headquarters in New York City.

J. A. STRACHAN NEW KEROTEST SALES MANAGER

MR. J. A. STRACHAN has been promoted to Sales Manager of the Brass Division of the Kerotest Manufacturing Co., 2225 Liberty Ave., Pittsburgh, Pa. Mr. Strachan had, during the past four years, been Assistant Sales Manager, and in his new position assumes the duties in the sales end of the company formerly handled by Mr. J. S. Forbes, who resigned recently to found his own company.

Mr. Strachan has been identified with the Kerotest Company for nearly ten years, and during the three years prior to his coming to Pittsburgh as Assistant Sales Manager, he represented the company in the Eastern territory, with headquarters in New York City.

The Kerotest Manufacturing Co. has been closely identified with the refrigeration industry in the manufacture of a complete line of fittings and valves, as well as other refrigeration specialties, and will further its activities in the refrigeration and air conditioning field as it has in the past.

NEW CATALOGS AND BULLETINS

PEERLESS OF AMERICA, INC., has just completed initial distribution of their new 1938 Refrigeration Products Catalog. This catalog is a sixty page book printed in two colors on enamel paper.

The style and treatment of products in this catalog is radically different and modern as compared with its predecessors. Large illustrations, bold page titles and paragraph headlines make it easy for the reader to locate whatever he seeks. Two column pages makes reading matter easier to follow.

Complete engineering and sales information accompanied by adequate tables and list prices is presented for each product listed. In addition, considerable space is devoted to useful information about commercial refrigeration in general and fin coils in particular, such as methods of determining the amount of coil surface necessary to properly cool a given fixture, and helpful hints on various installation problems.

The catalog is bound with mechanical Cercla binding and opens perfectly flat. The attractive cover is printed in Peerless black and orange on India enamel cover stock with a thick lacquer finish for brilliance and protection.

Interested parties who have not yet received their new Peerless Catalog may obtain a copy by writing on their letterhead direct to Peerless of America, Inc., 515 W. 35th Street, Chicago, Ill.

REFRIGERATION SERVICE, INC.—"Catalogs literally by the truck load" as can be seen by the following illustration, and even though the truck is a small one, it is still a lot of catalogs.

The illustration indicates the initial mailing of the new 1938 catalog, No. 9, which has just been forwarded to the mailing list of

Perhaps your Copy of the Catalog is in this load.

Refrigeration Service, Inc., 3109 Beverly Blvd., Los Angeles, Calif. The company has been issuing a catalog since 1930, the size increasing from 96 pages to 192 pages in the latest edition. Included with the catalog is a want and order book.

The company this year is observing its Tenth Anniversary as a refrigeration supply jobber.

THE IMPERIAL BRASS MFG. CO.—A new, condensed 24 page catalog, No. 88G, describing the complete line of Imperial refrigeration and air conditioning valves, fittings, tools, dehydrators, strainers and allied items, just issued. More than 250 different items—in a complete range of sizes—are described. Shown in the catalog are the new lower prices now in effect on many refrigeration parts.

Among the new Imperial items included in this catalog are three new tube benders, a complete line of soldering and brazing appliances, which include a Halide leak detector outfit, a line of extra heavy flared fittings, a new universal flywheel puller and a service valve kit for hermetically sealed condensing units.

IMPERIAL CATALOG

Important classifications of products include: shut-off valves, compressor valves, pressure relief valves, manifolds, dehydrators, strainers, high and low side floats, forged flare fittings, aluminum alloy fittings, brass pipe fittings, solder fittings, tube cutters and benders, flaring tools, pinch-off tools, refrigerant charging lines, charging and testing units, soldering and brazing equipment and gas and air torches.

Write The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

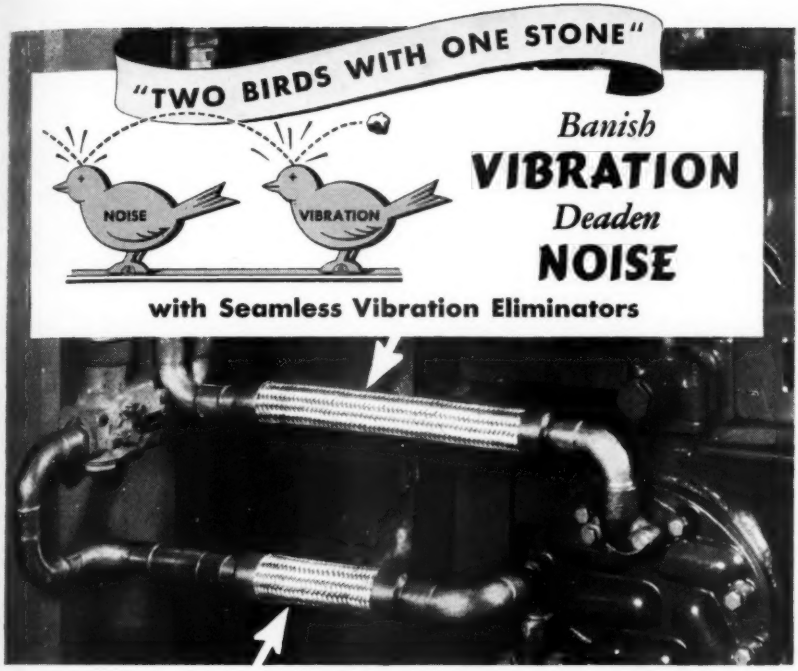
L. H. GILMER CO., PHILADELPHIA.—Catalog for the 1938 season. Increased this year to 144 pages, containing scores of new listings.

The Refrigerator Belt section now lists more than 4,450 separate models in 135 makes. Included are Household and Commercial Refrigeration Units up to 3 h.p., Water Coolers, Room Coolers, Milk Coolers, Bottle Coolers. In numerous instances the cabinet model number and year of manufacture, as well as the manufacturing part number and similar specific data, are given. All listings are arranged and sub-divided for easy reference.

In addition belt listings are given for 247 makes of Household Washing Machines, Ironers, Beer Pumps, Stokers, Oil Burners, Water Pumps and Woodworking Machines.

An arrangement of belt numbers by groups according to units serviced, with manufacturing part numbers, and a convenient belt length and cross-section chart are additional dealer helps.

Index to Advertisements



Do away with these two enemies of refrigerant lines by using American Vibration Eliminators

INSTALLING American Vibration Eliminators in the liquid and suction lines of air-conditioning equipment is the one sure way to put an end to the noise and vibration problem. These units are made from *FLEXIBLE* SEAMLESS BRONZE tubing. Since they are *Flexible* they readily isolate compressor vibration and prevent the transmission of noise along rigid pipe lines. Since they are *Seamless* they cannot leak. Since they are true *Bronze* they are non-corrodible.

Thousands of installations of American Vibration Eliminators have proved their ability to stand the greatest test of all... actual service. Leading air-conditioning manufacturers are incorporating these units as standard parts. Contractors, installers, consulting and service engineers are recommending them as the best insurance against noise and vibration.

Stocked with leading supply dealers, American Vibration Eliminators are obtainable to fit over copper water tube or into solder fittings in sizes up to 3" I.D. They come to you thoroughly clean, sealed with moisture-proof, dirt-proof caps. Ask for free descriptive bulletin VE-2.

38344A

THE AMERICAN BRASS COMPANY

American Metal Hose Branch

General Offices: WATERBURY, CONNECTICUT

BONNEY Ratchets are Designed Especially for Refrigeration Service

BONNEY Ratchets for Refrigeration Service are designed to meet the needs of the individual service man.

Illustrated are the two most popular types. They will meet practically all requirements for tools of this kind.

No. RF45 is a new Reversible Type. It is drop-forged of special alloy steel, carefully heat-treated and has plated finish. It is thin, light in weight, perfectly balanced and designed for work in close quarters. Either side of the ratchet head may be applied. The ¼" ratchet opening fits standard ¼" valve stems and when used with an adaptor will handle all ⅜" square drive sockets. Has ⅜" and ¼" square handle openings and a ½" hexagon opening in the handle.

No. RF22 is for the service engineer who prefers a non-reversible type. It is drop-forged of Bonney 'CV' Chrome-Vanadium Steel and has plated finish. The ratchet is fully enclosed. It has the same size openings and is designed for the same work as No. RF45. Both are quality tools, reasonably priced.

The full line of Bonney Tools for Refrigeration Service is illustrated in Catalog No. 38R. You need this book of "The Finest That Money Can Buy". Write for your copy today.

BONNEY FORGE & TOOL WORKS, Allentown, Pa.

In Canada—Gray-Bonney Tool Co., Ltd., St. Clarens & Royce Aves., Toronto
Export Office—38 Pearl St., New York, N. Y.
Stocked by Leading Jobbers Everywhere

Other Bonney Tools for Refrigeration Service

FLARE NUT WRENCHES
Two Wrenches take care of flare nuts for 3/16", 1/4", 5/16", 3/8", 7/16", 1/2" O.D. Tubing.

FLARING TOOL
Simple, fast and efficient. Handles 3/16", 1/4", 5/16", 1/2" and 5/8" O.D. Tubing.

TUBE CUTTER
A light, sturdily made tube cutter for all tubing from 1/8" to 1". Tool-steel cutting wheel has keen edge and leaves practically no burr.

PINCH-OFF TOOL
A simple and efficient Pinch-Off Tool for 1/4", 5/16" and 3/8" Tubing. Has plated finish. Low priced.

BONNEY Tools for Refrigeration Service